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AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*

03 AIR TRANSPORTATION AND SAFETY 2960

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 2961

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

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Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION 2964

Includes cockpit and cabin display devices; and flight instruments.

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07 AIRCRAFT PROPULSION AND POWER 2965

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion*.

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For related information see also *14 Ground Support Systems and Facilities (Space)*.

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Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*

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Includes powered and free-flight trajectories; and orbit and launching dynamics.

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Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air)*.

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16 SPACE TRANSPORTATION 2981

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

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Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 2981

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20 SPACECRAFT PROPULSION AND POWER 2982

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

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Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 2985
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 2987
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS 2990
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27 NONMETALLIC MATERIALS 2996
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 3001
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

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Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
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Includes magnetohydrodynamics and plasma fusion.
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76 SOLID-STATE PHYSICS **3109**
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS **3113**
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) **3114**
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT **3114**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 3115
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 3117
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 3117

89 ASTRONOMY 3121
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS N.A.
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 3122
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 3123
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 3124
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

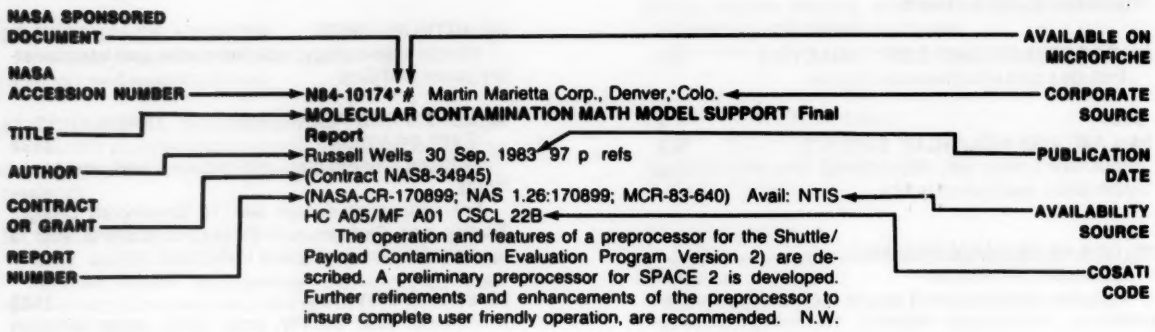
GENERAL

99 GENERAL N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-65
CORPORATE SOURCE INDEX I-73
CONTRACT NUMBER INDEX I-87
REPORT/ACCESSION NUMBER INDEX I-91

TYPICAL CITATION AND ABSTRACT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COSATI CODE
N84-10174*# Martin Marietta Corp., Denver, Colo.
MOLECULAR CONTAMINATION MATH MODEL SUPPORT Final Report
Russell Wells 30 Sep. 1983 97 p refs
(Contract NAS8-34945)
(NASA-CR-170899; NAS 1.26:170899; MCR-83-640) Avail: NTIS
HC A05/MF A01 CSCL 22B
The operation and features of a preprocessor for the Shuttle/ Payload Contamination Evaluation Program Version 2) are described. A preliminary preprocessor for SPACE 2 is developed. Further refinements and enhancements of the preprocessor to insure complete user friendly operation, are recommended. N.W.

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N84-28726* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 175)
1984 132 p
(NASA-SP-7037(175); NAS 1.21:7037(175)) Avail: NTIS HC $6.00 CSCL 01A

This bibliography lists 467 reports, articles and other documents introduced into the NASA scientific and technical information system in May 1984. Topics cover varied aspects of aeronautical engineering, geoscience, physics, astronomy, computer science, and support facilities. M.A.C.

N84-28727*# Douglas Aircraft Co., Inc., Long Beach, Calif.
CONFIGURATION DESIGN STUDIES AND WIND TUNNEL TESTS OF AN ENERGY EFFICIENT TRANSPORT WITH A HIGH-ASPECT-RATIO SUPERCRITICAL WING
Preston A. Henne, John A. Dahlin, Charles C. Peavey, and Donna S. Gerren Washington NASA May 1982 185 p refs
(Contract NAS1-15327)
(NASA-CR-3524; NAS 1.26:3524; ACEE-17-FR-1644) Avail: NTIS HC A09/MF A01 CSCL 01B

The results of design studies and wind tunnel tests of high aspect ratio supercritical wings suitable for a medium range, narrow body transport aircraft flying near M=0.80 were presented. The basic characteristics of the wing design were derived from system studies of advanced transport aircraft where detailed structural and aerodynamic tradeoffs were used to determine the most optimum design from the standpoint of fuel usage and direct operating cost. These basic characteristics included wing area, aspect ratio, average thickness, and sweep. The detailed wing design was accomplished through application of previous test results and advanced computational transonic flow procedures. In addition to the basic wing/body development, considerable attention was directed to nacelle/plyon location effects, horizontal tail effects, and boundary layer transition effects. Results of these tests showed that the basic cruise performance objectives were met or exceeded. Author

N84-28728# Naval Postgraduate School, Monterey, Calif.
THE ENFORCER AIRCRAFT PROGRAM: A LOWER-COST ALTERNATIVE WEAPON SYSTEM M.S. Thesis
R. P. Holt and R. D. Dolan Mar. 1984 90 p
(AD-A141564) Avail: NTIS HC A05/MF A01 CSCL 01/3

This research concerns a close air support weapon system known as the Enforcer aircraft. This system was first introduced to the military services from outside the formal competitive channels addressed in the procurement regulations. Although there is no specific operational requirement for an Enforcer type aircraft, it remains under consideration as a lower-cost alternative close support system in the so-called high/low mix acquisition strategy. The research analyzes the progress, to date, of the Enforcer as a system moving through the stages of the defense systems acquisition process. Emphasis is placed on the differing roles of the Enforcer's participants in that process. There is a detailed critical examination of an Air Force Enforcer cost effectiveness analysis and of the models used in that analysis. Conclusions and recommendations arising from the study are included, especially as they related to the expected defense acquisition environment in the latter half of the eighties. Author (GRA)

N84-28729# Aeronautical Research Labs., Melbourne (Australia).
REPORT OF AN OVERSEAS VISIT TO THE USA, PART 2
G. Long Jan. 1984 19 p
(AD-A142054; ARL/STRUC-TM-374) Avail: NTIS HC A02/MF A01 CSCL 01/3

This report describes an overseas visit to the USA made by the author. Visits were made to General Dynamics, Fort Worth to discuss FIIIC and to McAir, St. Louis to discuss F/A-18. The author also attended a meeting of TTCP Subgroup H as Australian National Leader. Part 1 of the report describes the visits made to General Dynamics and McAir, and Part 2 describes the TTCP meeting. Author (GRA)

N84-28730# Army Concepts Analysis Agency, Bethesda, Md. Force Systems Directorate.
AIRCRAFT SPARE STOCKAGE METHODOLOGY (AIRCRAFT SPARES) STUDY Final Report, Aug. 1983 - Mar. 1984
S. L. Penn, R. D. McAdoo, H. D. Frear, W. A. Bauman, and V. E. Jugan Apr. 1984 163 p
(AD-A142259; CAA-SR-84-12) Avail: NTIS HC A08/MF A01 CSCL 05/1

The Aircraft Spare Stockage Methodology Study was conducted primarily to provide the Army with an analytical tool for quick reaction, gross estimation of wartime spare parts requirements and costs as they relate to flying hour and availability objectives. An ability to identify problem parts and possible causes of the problems was also desired. The study compares the potential of five models--Overview, PARCOM, SESAME, and ACIM, and Dyna-METRIC--to meet the study objectives. Overview and PARCOM are recommended for complementary use in estimating wartime spare parts requirements, while Dyna-METRIC is recommended for more in-depth evaluation before its suitability for application to the problem is determined. Data collected and validation problems associated with all the models examined are discussed. Author (GRA)

N84-28731# Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany).
FLEXIBLE MANUFACTURING LINE FOR AIRCRAFT STRUCTURES OF SHEET METAL Final Report, Dec. 1982
Rolf-Dieter Stutz and Horst Becker Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 97 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-011; ISSN-0170-1339; TF211/152-08-83) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West

Germany DM 20,50

An automated manufacturing system for sheet metal aircraft structures is presented. Numerically controlled contour machining, heat treatment with glycol quenching, high pressure techniques, and computer assisted storage and transport techniques were developed. Results show a global manufacturing cost reduction of 25% resulting from reduced finishing operations, shortened processing time, increased efficiency, and shortened nonproductive operations. Author (ESA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N84-28732* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SHAPES FOR ROTATING AIRFOILS Patent
Gene J. Bingham, inventor (to NASA) Issued 10 Jul. 1984 12 p Filed 6 Mar. 1979 Supersedes N79-24958 (17 - 16, p 2070)
(NASA-Case-LAR-12396-1; US-Patent-4,459,083; US-Patent-Appl-SN-017889; US-Patent-Class-416-223R; US-Patent-Class-416-242; US-Patent-Class-244-35R) Avail: US Patent and Trademark Office CSCL 01A

An airfoil which has particular application to the blade or blades of rotor aircraft and aircraft propellers is presented. The airfoil thickness distribution, camber and leading edge radius are shaped to locate the airfoil crest at a more aft position along the chord, and to increase the freestream Mach number at which sonic flow is attained at the airfoil crest. The reduced slope of the airfoil causes a reduction in velocity at the airfoil crest at lift coefficients from zero to the maximum lift coefficient. The leading edge radius is adjusted so that the maximum local Mach number at 1.25 percent chord and at the designed maximum lift coefficient is limited to about 0.48 when the Mach number normal to the leading edge is approximately 0.20. The lower surface leading edge radius is shaped so that the maximum local Mach number at the leading edge is limited to about 0.29 when the Mach number normal to the leading edge is approximately 0.20. The drag divergence Mach number associated with the airfoil is moved to a higher Mach number over a range of lift coefficients resulting in superior aircraft performance.

Official Gazette of the U.S. Patent and Trademark Office

N84-28733* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 176)
Jul. 1984 176 p
(NASA-SP-7037(176); NAS 1.21:7037(176)) Avail: NTIS HC HC $6.00 CSCL 01A

This bibliography lists 670 reports, articles and other documents introduced into the NASA scientific and technical information system in June 1984. Author

N84-28734*# New York Univ., New York.
STUDY OF TRANSONIC FLOW OVER SWEPT WINGS Final Technical Report Abstract Only
1983 3 p
(Grant NGR-33-016-201)
(NASA-CR-173799; NAS 1.26:173799) Avail: NTIS HC A02/MF A01 CSCL 01A

The design of shockless airfoils that are appropriate for experimental work on a supersonic transport with an oblique wing are examined. A series of computer codes for the design and analysis of airfoils and wings in two dimensional and three dimensional transonic flow are studied. The oblique wing 3-D code was the forerunner of the later swept wing code. Techniques to incorporate the effect of an engine or fuselage in the inverse design code while using a minimum of computer resources are developed. M.A.C.

N84-28735*# Douglas Aircraft Co., Inc., Long Beach, Calif.
RESULTS OF DESIGN STUDIES AND WIND TUNNEL TESTS OF HIGH-ASPECT-RATIO SUPERCRITICAL WINGS FOR AN ENERGY EFFICIENT TRANSPORT
Doris K. Steckel, John A. Dahlin, and Preston A. Henne Hampton, Va. NASA. Langley Research Center Oct. 1980 174 p refs (Contract NAS1-14744)
(NASA-CR-159332; NAS 1.26:159332; ACEE-06-FR-9894) Avail: NTIS HC A08/MF A01 CSCL 01A

These basic characteristics of critical wings included wing area, aspect ratio, average thickness, and sweep as well as practical constraints on the planform and thickness near the wing root to allow for the landing gear. Within these constraints, a large matrix of wing designs was studied with spanwise variations in the types of airfoils and distribution of lift as well as some small planform changes. The criteria by which the five candidate wings were chosen for testing were the cruise and buffet characteristics in the transonic regime and the compatibility of the design with low speed (high-lift) requirements. Five wing-wide-body configurations were tested in the NASA Ames 11-foot transonic wind tunnel. Nacelles and pylons, flap support fairings, tail surfaces, and an outboard aileron were also tested on selected configurations.

Author

N84-28736*# Wichita State Univ., Kans.
EXPERIMENTAL STUDIES OF FLOW SEPARATION OF THREE AIRFOILS AT LOW SPEEDS Final Report
E. J. Rodgers, H. C. Seetharam, and W. H. Wentz, Jr. Washington NASA Mar. 1982 163 p
(Grant NGR-17-003-021)
(NASA-CR-3530; NAS 1.26:3530; AR-79-2) Avail: NTIS HC A08/MF A01 CSCL 01A

Wind tunnel tests were conducted on the NASA LS(1)-0421 Mod, NACA 2412 and NASA GA(W)-2 airfoil sections at a Reynolds number of 2.2 x 10(6) and a Mach number of 0.13. Detailed measurements of flow fields associated with turbulent boundary layers of these airfoils were obtained at pre-stall, near-stall, and post-stall angles of attack. Velocity and pressure survey results over the airfoil and in the associated wake, are presented for fully attached flow conditions through the stalled flow condition. Extensive force, pressure, tuft survey, hot-film survey, local skin friction and boundary layer data are also included. M.G.

N84-28737*# Vought Corp., Dallas, Tex.
STUDY OF AERODYNAMIC TECHNOLOGY FOR SINGLE-CRUISE ENGINE V/STOL FIGHTER/ATTACK AIRCRAFT Final Report, Jun. 1981 - Feb. 1982
H. H. Driggers, S. A. Powers, and R. T. Roush Feb. 1982 208 p refs
(Contract NAS2-11003)
(NASA-CR-166271; NAS 1.26:166271; Rept-2-52300/2R-53020) Avail: NTIS HC A10/MF A01 CSCL 01A

A conceptual design analysis is performed on a single engine V/STOL supersonic fighter/attack concept powered by a series flow tandem fan propulsion system. Forward and aft mounted fans have independent flow paths for V/STOL operation and series flow in high speed flight. Mission, combat and V/STOL performance is calculated. Detailed aerodynamic estimates are made and aerodynamic uncertainties associated with the configuration and estimation methods identified. A wind tunnel research program is developed to resolve principal uncertainties and establish a data base for the baseline configuration and parametric variations. M.A.C.

N84-28738*# Rockwell International Corp., Columbus, Ohio.
STUDY OF AERODYNAMIC TECHNOLOGY FOR SINGLE-CRUISE-ENGINE V/STOL FIGHTER/ATTACK AIRCRAFT Final Report, Jun. 1981 - Feb. 1982

Leon Mark Feb. 1982 236 p refs Sponsored in part by Naval Ship Research and Development Center and Naval Air Systems Command
(Contract NAS2-11002)
(NASA-CR-166270; NAS 1.26:166270; NR31H-100) Avail: NTIS HC A11/MF A01 CSCL 01A

Conceptual designs and analyses were conducted on two V/STOL supersonic fighter/attack aircraft. These aircraft feature low footprint temperature and pressure thrust augmenting ejectors in the wings for vertical lift, combined with a low wing loading, low wave drag airframe for outstanding cruise and supersonic performance. Aerodynamic, propulsion, performance, and mass properties were determined and are presented for each aircraft. Aerodynamic and Aero/Propulsion characteristics having the most significant effect on the success of the up and away flight mode were identified, and the certainty with which they could be predicted was defined. A wind tunnel model and test program are recommended to resolve the identified uncertainties. Author

N84-28739*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRESSURE DISTRIBUTION DATA FROM TESTS OF 2.29-METER (7.5-FT.) SPAN EET HIGH-LIFT RESEARCH MODEL IN LANGLEY 4- BY 7-METER TUNNEL
Harry L. Morgan, Jr. Jun. 1982 541 p
(NASA-TM-83111; NAS 1.15:83111) Avail: NTIS HC A23/MF A01 CSCL 01A

A 2.29 m (7.5 ft.) span high-lift research model equipped with full-span leading-edge slat and part-span double-slotted trailing-edge flap was tested in the Langley 4- by 7-Meter Tunnel to determine the low speed performance characteristics of a representative high aspect ratio suprcritical wing. These tests were performed in support of the Energy Efficient Transport (EET) program which is one element of the Aircraft Energy Efficiency (ACEE) project. Static longitudinal forces and moments and chordwise pressure distributions at three spanwise stations were measured for cruise, climb, two take-off flap, and two landing flap wing configurations. The tabulated and plotted pressure distribution data is presented without analysis or discussion. Author

N84-28740*# Old Dominion Univ., Norfolk, Va.
COMPUTER PROGRAM DOCUMENTATION FOR A SUBCRITICAL WING DESIGN CODE USING HIGHER ORDER FAR-FIELD DRAG MINIMIZATION Contractor Report, 1 Sep. 1979 - 31 Aug. 1980
John M. Kuhlman and Jin-Yea Shu Washington NASA Sep. 1981 173 p
(Grant NsG-1357)
(NASA-CR-3457; NAS 1.26:3457) Avail: NTIS HC A08/MF A01 CSCL 01A

A subsonic, linearized aerodynamic theory, wing design program for one or two planforms was developed which uses a vortex lattice near field model and a higher order panel method in the far field. The theoretical development of the wake model and its implementation in the vortex lattice design code are summarized and sample results are given. Detailed program usage instructions, sample input and output data, and a program listing are presented in the Appendixes. The far field wake model assumes a wake vortex sheet whose strength varies piecewise linearly in the spanwise direction. From this model analytical expressions for lift coefficient, induced drag coefficient, pitching moment coefficient, and bending moment coefficient were developed. From these relationships a direct optimization scheme is used to determine the optimum wake vorticity distribution for minimum induced drag, subject to constraints on lift, and pitching or bending moment. Integration spanwise yields the bound circulation, which is interpolated in the near field vortex lattice to obtain the design camber surface(s). Author

N84-28741*# Boeing Military Airplane Development, Seattle, Wash.
PAN AIR SUMMARY DOCUMENT (VERSION 1.0) Contractor Report, Jan. 1978 - Dec. 1981
Thomas Derbyshire and Kenneth W. Sidwell Washington NASA Apr. 1982 49 p refs Sponsored in cooperation with ASD, AFWAL, and Naval Coastal Systems Center
(Contract NAS2-9830)
(NASA-CR-3250; NAS 1.26:3250; D180-24910-1) Avail: NTIS HC A03/MF A01 CSCL 01A

The capabilities and limitations of the panel aerodynamics (PAN AIR) computer program system are summarized. This program uses a higher order panel method to solve boundary value problems involving the Prandtl-Glauert equation for subsonic and supersonic potential flows. Both aerodynamic and hydrodynamic problems can be solved using this modular software which is written for the CDC 6600 and 7600, and the CYBER 170 series computers.
A.R.H.

N84-28742*# Douglas Aircraft Co., Inc., Long Beach, Calif.
WIND TUNNEL TESTS OF HIGH-LIFT SYSTEMS FOR ADVANCED TRANSPORTS USING HIGH-ASPECT-RATIO SUPERCRITICAL WINGS Final Report
John B. Allen, Wayne R. Oliver, and Lee A. Spacht Washington NASA Jul. 1982 181 p refs
(Contract NAS1-15327)
(NASA-CR-3523; NAS 1.26:3523; ACEE-17-FR-1608) Avail: NTIS HC A09/MF A01 CSCL 01A

The wind tunnel testing of an advanced technology high lift system for a wide body and a narrow body transport incorporating high aspect ratio supercritical wings is described. This testing has added to the very limited low speed high Reynolds number data base for this class or aircraft. The experimental results include the effects on low speed aerodynamic characteristics of various leading and trailing edge devices, nacelles and pylons, ailerons, and spoilers, and the effects of Mach and Reynolds numbers.
M.A.C.

N84-28743*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TWO-DIMENSIONAL AERODYNAMIC CHARACTERISTICS OF THREE ROTORCRAFT AIRFOILS AT MACH NUMBERS FROM 0.35 TO 0.90
Gene J. Bingham and Kevin W. Noonan May 1982 73 p refs
(DA Proj. 1L1-61102-AH-45)
(NASA-TP-2000; L-14955; NAS 1.60:2000;
AVRADCOM-TR-82-B-2) Avail: NTIS HC A04/MF A01 CSCL 01A

Three airfoils designed for helicopter rotor application were investigated in the Langley 6- by 28-inch Transonic Tunnel to determine the two dimensional aerodynamic characteristics at Mach numbers from 0.34 to 0.88 and respective Reynolds numbers from about 4.4 x 10(6) power to 9.5 x 10(6) power. The airfoils have thickness-to-chord ratios of 0.08, 0.10, and 0.12. Trailing-edge reflex was applied to minimize pitching moment. The maximum normal-force coefficient of the RC(3)-12 airfoil is from 0.1 to 0.2 higher, depending on Mach number M, than that of the NACA 0012 airfoil tested in the same facility. The maximum normal-force coefficient of the RC(3)-10 is about equal to that of the NACA 0012 at Mach numbers to 0.40 and is higher than that of the NACA 0012 at Mach numbers above 0.40. The maximum normal force coefficient of the RC(3)-08 is about 0.19 lower than that of the NACA 0012 at a Mach number of 0.35 and about 0.05 lower at a Mach number of 0.54. The drag divergence Mach number of the RC(3)-08 airfoil at normal-force coefficients below 0.1 was indicated to be greater than the maximum test Mach number of 0.88. At zero lift, the drag-divergence Mach numbers of the RC(3)-12 and the RC(3)-10 are about 0.77 and 0.82, respectively.
Author

N84-28744# Cranfield Inst. of Tech., Bedfordshire (England). College of Aeronautics.
A RING SOURCE METHOD FOR PREDICTING THE AERODYNAMIC CHARACTERISTICS OF BODIES OF REVOLUTION
P. A. T. Christopher, H. S. Deo, and C. T. Shaw Mar. 1984 56 p refs
(COA-8409; ISBN-0-947767-05-3) Avail: NTIS HC A04/MF A01

A method if presented for determining the potential flow around bodies of revolution at incidence and yaw in uniform flow, and in curvilinear flow. This method utilizes the ring source method of Hess and Smith and gives substantial advantage over existing techniques. When compared with the method of Petrie, in a typical case, the computer run time is almost halved. The method is applicable to a wide class of bodies, both pointed and blunt, and determines both surface and flow field conditions. By its nature it is, of course, limited to low total angles of attack. Author

N84-28745*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PRACTICAL ADAPTIVE-GRID METHOD FOR COMPLEX FLUID-FLOW PROBLEMS
Kazuhiro Nakahashi and George S. Deiwert Jun. 1984 8 p refs
(NASA-TM-85989; A-9803; NAS 1.15:85989) Avail: NTIS HC A02/MF A01 CSCL 01A

A practical solution, adaptive-grid method utilizing a tension and torsion spring analogy is proposed for multidimensional fluid flow problems. The tension spring, which connects adjacent grid points to each other, controls grid spacings. The torsion spring, which is attached to each grid node, controls inclinations of coordinate lines and grid skewness. A marching procedure was used that results in a simple tridiagonal system of equations at each coordinate line to determine grid-point distribution. Multidirectional adaptation is achieved by successive applications of one-dimensional adaptation. Examples of applications for axisymmetric afterbody flow fields and two dimensional transonic airfoil flow fields are shown. Author

N84-28746*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NUMERICAL SIMULATION OF BOUNDARY-LAYER TRANSITION
P. R. Spalart Jun. 1984 7 p refs
(NASA-TM-85984; A-9796; NAS 1.15:85984) Avail: NTIS HC A02/MF A01 CSCL 01A

The transition to turbulence in boundary layers was investigated by direct numerical solution of the nonlinear, three-dimensional, incompressible Navier-Stokes equations in the half-infinite domain over a flat plate. Periodicity was imposed in the streamwise and spanwise directions. A body force was applied to approximate the effect of a nonparallel mean flow. The numerical method was spectra, based on Fourier series and Jacobi polynomials, and used divergence-free basis functions. Extremely rapid convergence was obtained when solving the linear Orr-Sommerfeld equation. The early nonlinear and three-dimensional stages of transition, in a boundary layer disturbed by a vibrating ribbon, were successfully simulated. Excellent qualitative agreement was observed with either experiments or weakly nonlinear theories. In particular, the breakdown pattern was staggered or nonstaggered depending on the disturbance amplitude. Author

N84-28747*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CALCULATION OF UNSTEADY AERODYNAMICS FOR FOUR AGARD STANDARD AEROELASTIC CONFIGURATIONS
Samuel R. Bland and David A. Seidel May 1984 80 p refs
(NASA-TM-85817; NAS 1.15:85817) Avail: NTIS HC A05/MF A01 CSCL 01A

Calculated unsteady aerodynamic characteristics for four Advisory Group for Aeronautical Research Development (AGARD) standard aeroelastic two-dimensional airfoils and for one of the AGARD three-dimensional wings are reported. Calculations were made using the finite-difference codes XTRAN2L (two-dimensional flow) and XTRAN3S (three-dimensional flow) which solve the transonic small disturbance potential equations. Results are given for the 36 AGARD cases for the NACA 64A006, NACA 64A010, and NLR 7301 airfoils with experimental comparisons for most of these cases. Additionally, six of the MBB-A3 airfoil cases are included. Finally, results are given for three of the cases for the rectangular wing. Author

N84-28748*# Comtek, Grafton, Va.
A PRELIMINARY DESIGN STUDY ON AN ACOUSTIC MUFFLER FOR THE LAMINAR FLOW TRANSITION RESEARCH APPARATUS Final Report
A. Louis Abrahamson Jul. 1984 45 p refs
(Contract NAS1-17244)
(NASA-CR-172374; NAS 1.26:172374) Avail: NTIS HC A03/MF A01 CSCL 01A

An acoustic muffler design of a research tool for studying laminar flow and the mechanisms of transition, the Laminar Flow and Transition Research Apparatus (LFTRA) is investigated. Since the presence of acoustic pressure fluctuations is known to affect transition, low background noise levels in the test section of the LFTRA are mandatory. The difficulties and tradeoffs of various muffler design concepts are discussed and the most promising candidates are emphasized. M.A.C.

N84-28749*# Boeing Commercial Airplane Co., Seattle, Wash.
THREE-DIMENSIONAL TRANSONIC POTENTIAL FLOW ABOUT COMPLEX 3-DIMENSIONAL CONFIGURATIONS
Theodore A. Reyhner Washington NASA Jul. 1984 76 p refs Sponsored by NASA
(NASA-CR-3814; NAS 1.26:3814; D6-52329) Avail: NTIS HC A05/MF A01 CSCL 01A

An analysis has been developed and a computer code written to predict three-dimensional subsonic or transonic potential flow fields about lifting or nonlifting configurations. Possible condfigurations include inlets, nacelles, nacelles with ground planes, S-ducts, turboprop nacelles, wings, and wing-pylon-nacelle combinations. The solution of the full partial differential equation for compressible potential flow written in terms of a velocity potential is obtained using finite differences, line relaxation, and multigrid. The analysis uses either a cylindrical or Cartesian coordinate system. The computational mesh is not body fitted. The analysis has been programmed in FORTRAN for both the CDC CYBER 203 and the CRAY-1 computers. Comparisons of computed results with experimental measurement are presented. Descriptions of the program input and output formats are included. Author

N84-28750*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A NUMERICAL SIMULATION OF THREE-DIMENSIONAL FLOW IN AN ADAPTIVE WALL WIND TUNNEL
J. P. Mendoza Aug. 1984 36 p refs
(NASA-TP-2351; A-9622; NAS 1.60:2351) Avail: NTIS HC A03/MF A01 CSCL 01A

Numerical simulations of three dimensional flows in a prototype adaptive wall wind tunnel are conducted at the Mach number of 0.6 to investigate: (1) wind tunnel wall interference, (2) active streamline control by varying air removal or injection along the walls, and (3) to develop a method for establishing wall boundary conditions for interference free flows. Wind tunnel wall interference could be controlled by using only the vertical velocity components. For the configuration tested, interference free flow with solid sidewalls can be approximated by using only floor and ceiling blowing/suction. M.A.C.

N84-28751# Rockwell International Corp., Thousand Oaks, Calif.
STUDY OF ASYMPTOTIC THEORY OF TRANSONIC WIND TUNNEL WALL INTERFERENCE Final Report, 30 May 1982 - 30 Aug. 1983
N. D. Malmuth and J. D. Cole Arnold AF Station, Tenn. AEDC May 1984 61 p
(Contract F40600-82-C-0005)
(AD-A141431; SC5332.6FR; AEDC-TR-84-8) Avail: NTIS HC A04/MF A01 CSCL 20/4

Asymptotic procedures were considered for two limiting cases of wind-tunnel interference assessment on transonic models. The first corresponds to slender configurations representative of fighter aircraft, and the second is associated with high aspect ratio shapes related to bombers and transports. In the first instance, solid cylindrical walls of radius much greater than the chord lead to interference effects on the drag of a greater magnitude than the

lift. A similarity law was discovered for this effect in which the normalized drag correction is proportional to the product of the blockage ratio, and a function of the free-stream and tunnel perturbation to the transonic similarity parameter. On the basis of this law, alterations to the similarity parameter can be sought to obtain interference-free conditions for the drag. In addition, the theory provides systematic means of extrapolating to zero model size. A numerical problem was formulated whose solution gives the structure of the interference flow field. For the high aspect ratio case associated with rectangular cross-section solid walls, asymptotic methods give a framework which is a generalization of lifting line theory for unconfined flows. Near the wing, the flow retains the two-dimensional strip theory character of the free-field situation. By contrast, the far field consists of a bound vortex, shedding trailing vorticity at a rate proportional to the spanwise gradient in the spanwise load distribution. GRA

N84-28752# Scientific Research Associates, Inc., Glastonbury, Conn.
INVESTIGATION OF THE MECHANISM OF TRANSONIC SHOCK WAVE/BOUNDARY LAYER INTERACTIONS USING A NAVIER-STOKES ANALYSIS Final Report, Jul. 1980 - May 1983
D. V. Roscoe, S. J.. Shamroth, H. J. Gibeling, and H. McDonald May 1984 89 p
(Contract DAAG29-80-C-0082)
(AD-A141551; SRA-R83-930006-F; ARO-17048.1-EG) Avail: NTIS HC A05/MF A01 CSCL 20/4

The present report discusses the development of a time-dependent Navier-Stokes code for use in predicting transonic shock-wave boundary layer interaction. In addition, various test cases which have been performed are discussed. The algorithm used to solve the equations is based upon the consistently split linearized block implicit method of Briley and McDonald (15, 16). The philosophy and use of a solution adaptive mesh is also described. The test cases studied in this report are: normal shock wave boundary layer interaction in a constant area circular pipe, steady transonic flow over an axisymmetric bump, unsteady flow over an axisymmetric bump, supersonic flow over an axisymmetric compression corner and oblique shock wave impingement on a flat plate boundary layer. Author (GRA)

N84-28753# Coast Guard Research and Development Center, Groton, Conn.
AIRSHIP PROOF-OF-CONCEPT EVALUATION Interim Report, period ending Aug. 1983
H. G. Ketchen May 1984 62 p
(AD-A141759; CGR/DC-4/84; USCG-D-12-84) Avail: NTIS HC A04/MF A01 CSCL 01/2

Field tests were conducted off Oregon Inlet, NC, to evaluate the small target detection capability of lookouts on board an airship of modern design and materials and the potential advantages in the use of this type of platform for marine science activities (MSSA) in support of a variety of Coast Guard missions. Visual searches were conducted for small orange-canopied life rafts (4- to 6-man) and simulated persons in the water. The MSA experiments investigated the airship's capability to interface with the ocean including air and water sampling from the ocean surface and near surface, remote sensing, and air deployment/recovery of current measuring devices and other instruments. Target and airship positions were monitored with a computer-controlled microwave tracking system providing trackline and detection/miss range reconstruction accuracy to better than 0.1 nautical miles. The very limited size of the detection data base did not permit a complete evaluation of the platform's performance under a wide variety of environmental conditions and in searches for a number of different target types, but it did allow for a first order estimate of small target search performance under good weather conditions. The data indicates that the airship appears to be at least as good as and possibly an even better visual search platform than fixed or rotary wing aircraft used under similar conditions. For MSA use, the airship displayed excellent versatility and adaptability, lending itself well for this type of work. GRA

N84-28754# Tennessee Univ. Space Inst., Tullahoma.
TRANSONIC INTERFERENCE FLOW-FIELD ANALYSIS FOR WING-BODY-PYLON-STORE Final Report, Sep. 1981 - Sep. 1982
P. Sundaram and S. N. Chaudhuri May 1983 150 p
(Contract F08635-81-C-0235; AF Proj. 2307)
(AD-A141811; AD-E800931; AFATL-TR-83-42) Avail: NTIS HC A07/MF A01 CSCL 20/4

An approximate method to compute the flow-field velocities around wing-body-pylon-store configurations is presented. The method adds transonic non-linear velocities to the linear velocities, computed using Hess's panel method. The non-linear effects are computed by an integral Equation method derived for three-dimensional transonic small disturbance equations. A viscous/inviscid interaction procedure incorporates Cebeci's two-dimensional small cross flow boundary layer computations. Viscous effects over lifting and non-lifting bodies are included. The viscous effects can be simulated by either the displacement or blowing method. Also outlined is the inclusion of weak separation and wake effects in the interaction procedure. An internal flow correction is applied to predict the flow in the region between the store and the wing. A finite difference scheme to solve the full potential equations over an axisymmetric body is used to compute the transonic non-linear effects for the store-on-body pressure computation. GRA

N84-28755# Aeronautical Research Labs., Melbourne (Australia).
AN EXPERIMENTAL INVESTIGATION OF THE AERODYNAMIC EFFECTS OF FORWARD FACING WEDGES ON THE UPPER SURFACE AND LEADING EDGE OF AN AEROFOIL, WITH EMPHASIS AT HIGH ANGLES OF ATTACK
A. P. Brown Aug. 1983 54 p
(AD-A142053; ARL-AERO-TM-356) Avail: NTIS HC A04/MF A01 CSCL 01/1

Wind tunnel tests were carried out to determine the effect on the longitudinal aerodynamic characteristics of a two-dimensional aerofoil fitted with descrete forward-facing wedges (base to aerofoil chord ratio 0.24 and 0.39) at the leading edge and on the upper surface of the aerofoil. The forward-facing wedges were conceived as a means of delaying stall and enhancing lift at high incidence. Thus these may be useful in low speed flight (approach and landing) where they would be extended from the clean wing surface along with the trailing edge flaps. Tests were conducted at Mach numbers 0.2/0.3, over an incidence range of -10 to +20 degrees. Corresponding chord Reynolds numbers were 0.57 and 0.84 million (compared to an inflight value of 2.5 million for a wing of chord 1.25 meters and airspeed of 60 knots). The results at M=0.2 are more extensive than those at M=0.3. GRA

N84-28756# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.
PARACHUTE DESCENT FROM ALTITUDE 5000 TO 7000 METERS
Cay Bjurqvist, Christer Spaangberg, and Olof Tillhagen Feb. 1983 13 p In SWEDISH; ENGLISH summary
(FOA-C-59008-H1; ISSN-0347-7665) Avail: NTIS HC A02/MF A01

In order to simulate ejection from Swedish Air Force aircraft type 35 or 37, parachute descents were made from altitudes up to 7000 m with fall in a drag chute down to 3000 meters where the main parachute was manually deployed. Three parachutists used Air Force standard flying suits and equipment. The experiences from the descents are reported and proposals are made about high altitude clothing and equipment, e.g., oxygen masks. Author (ESA)

N84-28757# European Space Agency, Paris (France).
MEASUREMENT OF UNSTEADY AERODYNAMIC PRESSURES
Peter Bublitz May 1984 25 p refs Transl. into English of "Messung von Instationaeren Aerodynamik Druecken" rept. DFVLR-Mitt-83-08 DFVLR, Goettingen, West Germany, 1983
(ESA-TT-834; DFVLR-Mitt-83-08) Avail: NTIS HC A02/MF A01; original German version available from DFVLR, Cologne DM 11,50

User requirements on pressure transducers for measuring unsteady pressures are outlined. Application of the unsteady aerodynamic pressure measuring technique to the flutter and the dynamic response problem is described. It is shown that the requirements set for steady state aerodynamic pressure distribution measurements (such as a high resolution and intensitivity to temperature drifts, overload and accelerations) are particularly necessary in the case of unsteady pressure measurements. Author (ESA)

N84-28758# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Instationaere Aerodynamik.

COMPARATIVE MEASUREMENTS OF THE UNSTEADY PRESSURES ON THREE OSCILLATING WING-TIP MODELS

Wolfgang Wagner Jan. 1984 68 p refs

(DFVLR-FB-84-07) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 23,50

Low speed wind tunnel investigations on steady and unsteady pressure distributions of ogee, trapezoidal and tapered wing tips are discussed. A rectangular blade serves as a reference. The decisive parameter variables are angle of attack, frequency and amplitude of the forced harmonic oscillations about the l/4 axis, and Reynolds number. The boundary regions where flow separation begins and dynamic stall occurs are also investigated. Tip vortex formation and shape in the pressure distribution on the blade surfaces are studied. Pressure distribution curves of the vortex parameters calculated by ultrasonic measurements of the wake are considered. Author (ESA)

N84-28759# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.

SIMULATION OF VEHICLE AERODYNAMICS BY MEANS OF A GENERAL-PURPOSE COMPUTER PROGRAM

D. Brian Spalding May 1984 18 p refs

(CFD/84/4) Avail: NTIS HC A02/MF A01

Application of the PHOENICS computer code to automobile engine flow dynamics simulation and to vehicle aerodynamics is summarized. The three dimensional Navier-Stokes model is realistic and fairly economical. Although cheaper, and realistic for the front half of the vehicle, the potential method requires information about flow in the wake, which only Navier-Stokes solutions can provide. Combination methods (potential + boundary layer + Navier-Stokes + turbulence model) are feasible. Comparisons with experiments for simple shapes are encouraging. One code suffices for simulating engines, vehicle aerodynamics, flow through valves, inlet and exhaust manifolds, heat-exchange equipment, air conditioning, lubrication, and body-vehicle impact. Author (ESA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N84-28760# National Transportation Safety Board, Washington, D. C.

AIRCRAFT ACCIDENT REPORT: LAS VEGAS AIRLINES, FLIGHT 88, PIPER PA-31-350, GRAND CANYON, ARIZONA, AUGUST 17, 1983

15 May 1984 24 p

(PB84-910405; NTSB-AAR-84-05) Avail: NTIS HC A02/MF A01 CSCL 01C

A Piper PA-31-350, N88LV, departed North Las Vegas Airport as the second of five Las Vegas Airlines airplanes flying to Grand Canyon National Park Airport. When weather conditions precluded flying over the Shivwits Plateau under visual conditions as normally done, the pilot flew into the west end of the Grand Canyon at 5,000 feet. Deteriorating weather conditions were encountered. The pilot decided to abort the flight and climb out. Attempts to contact Las Vegas 88 by radio were fruitless. The wreckage was found on August 18, 1983, by company pilots on the west wall of a mesa inside the Canyon. The airplane was destroyed by impact and by postimpact fire. The pilot and all nine passengers were killed. The National Transportation Safety Board determines that the probable cause of this accident was the pilot's failure to maintain adequate visual flight references to positively identify his position while flying below the rim of the Grand Canyon which resulted in his selection of an inappropriate flightpath and consequent collision with the terrain during an attempt to climb the airplane in instrument meteorological conditions to a safe altitude above the rim of the canyon. A.R.H.

N84-28761# National Transportation Safety Board, Washington, D. C.

SAFETY STUDY: AIRPORT CERTIFICATION AND OPERATIONS

11 Apr. 1984 83 p

(PB84-917002; NTSB-SS-84-02) Avail: NTIS HC A05/MF A01 CSCL 01C

The nature and scope of regulations governing airport certification, the Federal Aviation Administration's (FAA) method of assuring compliance with the regulations, and the FAA's airport inspections are evaluated. Facility and equipment conditions and airport programs and procedures which exist to satisfy regulatory requirements, such as bird hazard reduction, snow removal, fuel storage and handling, public protection, ground vehicle operation, crash fire rescue training, condition assessment and reporting, and emergency plan exercises are discussed. Complex issues of obstructions, noise abatement procedures, and land use which have plagued airports, landowners, and local authorities for years are addressed as well as their relationship to the potential for loss and destruction as a result of accidents in residential or commercial areas which have surrounded and constrained some airports. Analysis of air carrier accidents occurring in the United States from 1964 to 1981 in which airplanes had traversed areas adjacent to runways shows substantial decrease in rates of all encroachment accidents during the postvertification period (1973 through 1981) is the consistently low rate of air carrier overshoot accidents since 1977 is noteworthy. A.R.H.

N84-28762# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

A SLAM (SIMULATION LANGUAGE FOR ALTERNATIVE MODELING) AIRFIELD MODEL FOR AIRLIFT OPERATIONS M.S. Thesis

R. G. Johnson Mar. 1984 68 p

(AD-A141106; AFIT/GST/OS/84M-12) Avail: NTIS HC A04/MF A01 CSCL 15/5

This study developed a SLAM airfield tailored for airlift operations. The model is formulated as a network and models loading, fueling, and maintenance of airlift aircraft. Only C-130, C-141, and C-5 aircraft can be considered. The primary model inputs are aircraft input rates, and the availability of ramp space, maintenance team, load team, and k-loader resources. The output includes average ground-time, resource usage, and pallets airlifted from the airfield. An experiment is made to identify a 'best' strategy for aircraft input rates through a fixed airfield. The results show that any one of five input strategies out of 64 examined are of equal effectiveness. Author (GRA)

N84-28763# Logistics Management Inst., Washington, D. C.

SYSTEM SAFETY IN AIRCRAFT ACQUISITION

F. R. Frola and C. O. Miller Jan. 1984 119 p

(Contract MDA903-81-C-0166)

(AD-A141492; LMI-ML214) Avail: NTIS HC A06/MF A01 CSCL 05/1

This report identifies management initiatives for strengthening the effectiveness of system safety in aircraft acquisition programs. More aggressive implementation of existing system safety policy can help reduce the mishap rate and the need for costly modification programs to correct safety deficiencies. Recommendations to OSD and the Military Departments include: (1) the need for

continuing top management support; (2) staffing and funding for system safety efforts commensurate with responsibilities set forth in policy statements; (3) emphasis on the man-machine interface and the associated need for better coordination of system safety and human factors engineering activities; (4) improved methods for detecting system software hazards; (5) better utilization of advanced technology, including flight data recorders, ground proximity warning systems, and collision avoidance systems; (6) writing better contracts with respect to system safety tasks; and (7) more effective recruiting, training, and retention of system safety personnel. Author (GRA)

N84-28764# Federal Aviation Agency, Atlantic City, N.J.
STUDY ON TRANSPORT AIRPLANE UNPLANNED WATER CONTACT Final Report, 1981 - 1982
D. Johnson Jan. 1984 38 p
(AD-A142092; DOT/FAA/CT-84/3) Avail: NTIS HC A03/MF A01 CSCL 01/2

This study provides for an identification of accident scenario(s) and associated occupant risks and survival equipment needs, relating to the inadvertent or unplanned water contact of transport category airplanes. This identification was obtained, in part, from the results of contractual studies of transport accident data. The subject study concludes that while the unplanned water contact of a transport airplane occurs less frequent than corresponding ground contact, the impact loads are often higher, leading to greater fuselage damage. Also, the unplanned water contact occurs more frequent than a planned water landing (ditching) and usually involves adverse flooding conditions. These conditions, in turn, affect the ability of occupants to retrieve, deploy and/or don on-board floatation equipment. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N84-28765# Engineering and Economics Research, Inc., Vienna, Va.
NATIONAL AIRSPACE REVIEW BENEFITS AND COSTS Interim Report, Sep. 1982 - Apr. 1984
L. H. Mayo, Jr., H. W. Minnick, J. H. Dargue, and P. V. Tawari May 1984 57 p refs
(Contract DTFA01-82-Y-30562)
(FAA-AT-84-1; IR-1) Avail: NTIS HC A04/MF A01

Three of the twenty enhancement areas identified for implementation within the National Airspace Review (NAR) are evaluated as to their benefits and costs. These areas are Airport Radar Service Area (ARSA), ARTCC Resectorization, and the Random routes aspect of area navigation (RNAV) Integration. A methodological approach to evaluation of benefits and costs, suitable for application to all enhancement areas, is developed. Each of the three areas is treated in detail and supported by quantitative data placed in appendices. M.A.C.

N84-28766# Federal Aviation Administration, Washington, D.C. Program Engineering and Maintenance Service.
COCKPIT DATA MANAGEMENT REQUIREMENTS (CURRENT TECHNOLOGY AIRCRAFT) Final Report
Thomas P. Berry Oct. 1983 309 p refs
(Contract DTFA01-80-C-10030)
(FAA-PM-83-25; Rept-1378-03-8-3150) Avail: NTIS HC A14/MF A01

A technique is described for estimating the effect of the data management tasks imposed on flight crews by new systems. It presents the development of a data base of data management tasks in current technology aircraft and examines the effect of four proposed new systems on the data management tasks of a flight crew in these aircraft. Data items and times for various emergency situations are included such as the effect of hydraulic and flight control malfunction and the effect of engine failure due to fire. Times and data items for these conditions were developed in a United Airlines DC-10 flight simulator. Flight crew task-loading profiles showing the action levels caused by the malfunction are included in each annex. A.R.H.

N84-28767*# McDonnell Aircraft Co., St. Louis, Mo.
STUDY OF AERODYNAMIC TECHNOLOGY FOR SINGLE-CRUISE-ENGINE V/STOL FIGHTER/ATTACK AIRCRAFT Final Report, Jun. 1981 - Feb. 1982
J. R. Hess and R. L. Bear Feb. 1982 179 p refs Sponsored in part by the Naval Ship Research and Development Center and Naval Air Systems Command
(Contract NAS2-11001)
(NASA-CR-166269; NAS 1.26:166269; MDC-IR0285) Avail: NTIS HC A09/MF A01 CSCL 01D

A viable, single engine, supersonic V/STOL fighter/attack aircraft concept was defined. This vectored thrust, canard wing configuration utilizes an advanced technology separated flow engine with fan stream burning. The aerodynamic characteristics of this configuration were estimated and performance evaluated. Significant aerodynamic and aerodynamic propulsion interaction uncertainties requiring additional investigation were identified. A wind tunnel model concept and test program to resolve these uncertainties and validate the aerodynamic prediction methods were defined. Author

N84-28768# Mitre Corp., McLean, Va. Metrek Div.
AIRCRAFT TRAFFIC DENSITY IN THE LOS ANGELES BASIN
N. A. Spencer Aug. 1983 50 p
(Contract DTFA01-82-C-10003)
(AD-A141435; MTR-83W00091; DOT/FAA/PM-83/21) Avail: NTIS HC A03/MF A01 CSCL 01/2

An estimate of the number of aircraft flying in the Los Angeles basin was made using airborne and ground-based radar measurements. These estimates are combined with FAA projections of traffic growth to predict the future aircraft density as seen by an airborne Traffic Alert and Collision Avoidance System (TCAS). Results include the findings that: (1) peak density decreases approximately linearly with radius, (2) the number of aircraft increases linearly with the sum of tower operations, (3) for year 2000, within a radius of 5 nmi, the projected maximum density is 0.45 aircraft/nmi2, the projected maximum number of aircraft is 35, and the projected maximum number of ATCRBS aircraft is 20, and (4) within a radius of 10 nmi, these figures are 0.24, 75, and 43, respectively. GRA

N84-28769# Transportation Systems Center, Cambridge, Mass.
DIFFERENTIAL NAVSTAR GPS (GLOBAL POSITIONING SYSTEM) DESIGN CONCEPT FOR HARBOR/HARBOR ENTRANCE MARINE NAVIGATION Final Report, Oct. 1982 - Oct. 1983
J. Vilcans and R. M. Kalafus May 1984 80 p
(AD-A141665; DOT-TSC-CG-83-5; USCG-D-08-84) Avail: NTIS HC A05/MF A01 CSCL 17/7

This report presents a design concept for a high-precision system for harbor/harbor entrance navigation. The concept is based on differential operation of NAVSTAR GPS, whereby local corrections to the satellite signals are broadcast to mariners in a harbor area. The system is expected to provide continuous navigation service with a predictable (absolute) accuracy of 8-12 meters (2drms). The design is configured around a hypothetical system to cover New York Harbor. The report addresses the hardware configuration and costs of installing and maintaining the system. Also provided are guidelines for verifying the performance of the system. GRA

N84-28770# Naval Ocean Systems Center, San Diego, Calif.
HP-85/MINI-RANGER NAVIGATION SYSTEM Final Report

R. Uhrich and M. McCord Apr. 1984 34 p
(AD-A142131; NOSC/TD-690) Avail: NTIS HC A03/MF A01 CSCL 17/9

The HP-85/Mini-Ranger Navigation System consists of a general purpose personal computer and an off-the-shelf radar ranging device combined into an automatic and portable system for navigation near the shore. This system provides a real-time plot of ship's position relative to fixed transponders. Time and position data can be printed on paper or saved on magnetic tape. The computer program can be modified for any specific geographic location, making the system a readily transportable tool.
Author (GRA)

N84-28771# Department of the Navy, Washington, D. C.
ANALOG FIBER GYRO WITH EXTENDED LINEAR RANGE Patent Application
W. K. Burns and R. P. Moeller, inventors (to Navy) Filed 24 Feb. 1984 33 p
(AD-D011009; US-Patent-Appl-SN-583549) Avail: NTIS HC A03/MF A01 CSCL 17/7

The present invention relates generally to analog gyroscopes, and more particularly to an analog fiber optic gyroscope system which provides an extended linear dynamic range for platform rotation rate measurements.
GRA

N84-28772# Elektronik-System G.m.b.H., Munich (West Germany). Technische Systeme Entwurf.
SATELLITE AIDED NAVIGATION (INNAVSAT) Final Report, Jun. 1982
Johannes Wegscheider Bonn Bundesministerium fuer Forschung und Technologie Mar. 1984 133 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-003; ISSN-0170-1339) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 28

The establishment of an international satellite organization INNAVSAT for a worldwide navigation/SOS system is considered. Technical, operational, and financial user requirements are defined in comparison with existing systems. It is concluded that available global positioning systems meet the technical/operational requirements of all users. It is recommended to promote the development of low cost medium to lower accuracy receivers.
Author (ESA)

N84-28773# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.
DEVELOPMENT, SET UP AND TESTING OF A MEASURING SYSTEM FOR COMPONENTS OF THE DERIVED AZIMUTH SYSTEM (DAS) Final Report, Dec. 1982
Heinz Winter Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 76 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-005; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16

A measurement system for the evaluation of radio navigation systems e.g., distance measurement equipment (DME)-derived azimuth system (DAS) is discussed. Subsystems comprise high precision trajectory generation, telemetry, data processing with real time display, multipath measurement, and traffic load simulation. A laser tracker, a tracking radar, and an inertial onboard navigation system were developed. A Kalman filter onboard the test aircraft was used for the integration of these sensors. Test flights show a position accuracy of 0.3 m and a speed accuracy of 0.01 m/sec.
Author (ESA)

N84-28774# Technische Univ., Brunswick (West Germany). Inst. fuer Verkehr, Eisenbahnwesen und Verkehrssicherung.
INVESTIGATION OF THE TECHNOLOGY OF THE MICROWAVE LANDING SYSTEM TIME REFERENCE SCANNING BEAM (TRSB) Final Report, Mar. 1983
Rolf Springer Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 85 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-008; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18

A simulation model for a microwave landing system is examined. The time reference scanning beam (TRSB) system offers azimuth, elevation, and distance measuring for approach and landing. The simulation model enables the influence of interferences on the system under multipath conditions of difficult sites to be tested.
Author (ESA)

N84-29281# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
SATELLITE DOPPLER POINT POSITIONING USING THE NAVY NAVIGATION SATELLITE SYSTEM
Wolfgang Schlueter *In its* Repts. on Cartography and Geodesy. Ser. 2: Translations, No. 40 1983 p 23-97 refs Presented at Lecture Ser., Wuhan, China, Nov.-Dec. 1981 (For primary document see N84-29279 19-43)
Avail: NTIS HC A08/MF A01

N84-29282# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
FINAL RESULTS OF DOPPLER POINT POSITIONING AT SEVERAL TIMEKEEPING LABORATORIES IN EUROPE
Wolfgang Schlueter and Ludwig Amberg *In its* Repts. on Cartography and Geodesy. Ser. 2: Translations, No. 40 1983 p 99-107 refs (For primary document see N84-29279 19-43)
Avail: NTIS HC A08/MF A01

N84-29286# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DOPPLER OBSERVATION CAMPAIGN IN THE IVORY COAST: RECONNAISSANCE, MEASURING, INTERPRETATION AND EXPERIENCE Final Report [DIE DOPPLERMESSKAMPAGNE IN DER ELFENBEINKUESTE - ERKUNDUNG, MESSUNGSABLAUF, AUSWERTUNG UND ERFAHRUNGEN]
Walter Etling, Patrice Manti, Wolfgang Mueller, and Ewald Reinhart *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 91 1983 p 25-48 refs In GERMAN; ENGLISH and FRENCH summary (For primary document see N84-29286 19-43)
Avail: NTIS HC A05/MF A01

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-28775*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROSPACE ENGINEERING DESIGN BY SYSTEMATIC DECOMPOSITION AND MULTILEVEL OPTIMIZATION
Jaroslaw Sobieszczanski-Sobieski, Jean-Francois M. Barthelemy (Virginia Polytechnic Inst. and State Univ.), and Gary L. Giles Jun. 1984 15 p refs Proposed for presentation at the 14th Congr. of the International Council of the Aeronautical Sciences (ICAS), Toulouse, 10-14 Sep. 1984
(NASA-TM-85823; NAS 1.15:85823) Avail: NTIS HC A02/MF A01 CSCL 01C

A method for systematic analysis and optimization of large engineering systems, by decomposition of a large task into a set of smaller subtasks that is solved concurrently is described. The subtasks may be arranged in hierarchical levels. Analyses are carried out in each subtask using inputs received from other subtasks, and are followed by optimizations carried out from the

bottom up. Each optimization at the lower levels is augmented by analysis of its sensitivity to the inputs received from other subtasks to account for the couplings among the subtasks in a formal manner. The analysis and optimization operations alternate iteratively until they converge to a system design whose performance is maximized with all constraints satisfied. The method, which is still under development, is tentatively validated by test cases in structural applications and an aircraft configuration optimization. Author

N84-28776*# Boeing Commercial Airplane Co., Seattle, Wash.
DEVELOPMENT OF INTEGRATED PROGRAMS FOR AEROSPACE-VECHICLE DESIGN (IPAD). IPAD USER REQUIREMENTS: IMPLEMENTATION (FIRST-LEVEL IPAD)
12 Mar. 1980 100 p refs
(Contract NAS1-14700)
(NASA-CR-162713; NAS 1.26:162713; D6-IPAD-70016-D-1) Avail: NTIS HC A05/MF A01 CSCL 01C

The requirements implementation strategy for first level development of the Integrated Programs for Aerospace Vehicle Design (IPAD) computing system is presented. The capabilities of first level IPAD are sufficient to demonstrated management of engineering data on two computers (CDC CYBER 170/720 and DEC VAX 11/780 computers) using the IPAD system in a distributed network environment. M.A.C.

N84-28777*# Boeing Commercial Airplane Co., Seattle, Wash.
NACELLE AERODYNAMIC AND INERTIAL LOADS (NAIL) PROJECT Summary Report, Oct. 1979 - Aug. 1981
Washington NASA Jun. 1982 26 p refs
(Contract NAS1-15325)
(NASA-CR-3585; NAS 1.26:3585; D6-51141) Avail: NTIS HC A03/MF A01 CSCL 01C

Inlet airloads were measured by integration of pressures recorded at 252 locations on the right hand inboard (JT9D-7A) nacelle of the Boeing 747 aircraft. Pressures were recorded at 45 locations on the right hand outboard nacelle for comparison. Inertial loads were measured on both nacelles using accelerometers and rate gyros. Flight conditions included takeoffs at several gross weights, high g turns, and a simulated acceptance flight. Airloads at takeoff rotation were found to be larger than at any other normal service condition because of the combined effects of high angle of attack and high engine airflow. Inertial loads were smaller than previous estimates had indicated. A procedure is given for estimating inlet airloads at low speeds and high angles of attack for any underwing high bypass ratio turbofan installation approximately resembling the one tested. Flight procedure modifications are suggested that may result in better fuel economy retention in service. Pressures were recorded on the core cowls and pylons of both engine installations and on adjacent wing surfaces for use in development of computer codes for analysis of installed propulsion system aerodynamic drag interference effects. A.R.H.

N84-28778*# Boeing Commercial Airplane Co., Seattle, Wash. Preliminary Design Dept.
AIRCRAFT SURFACE COATINGS Final Contractor Report, Jan. 1980 - Feb. 1982
Jun. 1982 164 p refs
(Contract NAS1-15325)
(NASA-CR-165928; NAS 1.26:165928; D-49355) Avail: NTIS HC A08/MF A01 CSCL 01C

Liquid, spray on elastomeric polyurethanes are selected and investigated as best candidates for aircraft external protective coatings. Flight tests are conducted to measure drag effects of these coatings compared to paints and a bare metal surface. The durability of two elastometric polyurethanes are assessed in airline flight service evaluations. Laboratory tests are performed to determine corrosion protection properties, compatibility with aircraft thermal anti-icing systems, the effect of coating thickness on erosion durability, and the erosion characteristics of composite leading edges-bare and coated. A cost and benefits assessment is made to determine the economic value of various coating configurations to the airlines. M.A.C.

N84-28779*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN EXPERIMENTAL AND THEORETICAL ANALYSIS OF THE AERODYNAMIC CHARACTERISTICS OF A BIPLANE-WINGLET CONFIGURATION M.D. Thesis
Peter D. Gall Jun. 1984 97 p refs
(NASA-TM-85815; NAS 1.15:85815) Avail: NTIS HC A05/MF A01 CSCL 01C

Improving the aerodynamic characteristics of an airplane with respect to maximizing lift and minimizing induced and parasite drag are of primary importance in designing lighter, faster, and more efficient aircraft. Previous research has shown that a properly designed biplane wing system can perform superiorly to an equivalent monoplane system with regard to maximizing the lift-to-drag ratio and efficiency factor. Biplanes offer several potential advantages over equivalent monoplanes, such as a 60-percent reduction in weight, greater structural integrity, and increased roll response. The purpose of this research is to examine, both theoretically and experimentally, the possibility of further improving the aerodynamic characteristics of the biplanes configuration by adding winglets. Theoretical predictions were carried out utilizing vortex-lattice theory, which is a numerical method based on potential flow theory. Experimental data were obtained by testing a model in the Pennsylvania State University's subsonic wind tunnel at a Reynolds number of 510,000. The results showed that the addition of winglets improved the performance of the biplane with respect to increasing the lift-curve slope, increasing the maximum lift coefficient, increasing the efficiency factor, and decreasing the induced drag. A listing of the program is included in the Appendix. Author

N84-28780*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IMPROVING THE EFFICIENCY OF SMALLER TRANSPORT AIRCRAFT
Robert T. Jones Jul. 1984 10 p refs
(NASA-TM-85992; A-9831; NAS 1.15:85992) Avail: NTIS HC A02/MF A01 CSCL 01C

Considered apart from its propulsive system the high altitude airplane itself adapted to higher flight altitudes than those in current use. Scaling on the assumption of constant aircraft density indicates that this conclusion applies most importantly to smaller transport aircraft. Climb to 60,000 ft could save time and energy for trips as short as 500 miles. A discussion of the effect of winglets on aircraft efficiency is presented. A 10% reduction of induced drag below that of a comparable elliptic wing can be achieved either by horizontal or vertical wing tip extensions. B.G.

N84-28781# Air Force Flight Test Center, Edwards AFB, Calif.
STORES WEIGHT AND INERTIA SYSTEM UPDATE: CABLE ATTACHMENT REDESIGN, FLEXIBLE LENGTH PARAMETER CALIBRATION, DATA SHEET REVISION Final Report, Oct. 1983 - Feb. 1984
Kent J. Wong Feb. 1984 24 p
(AD-A141087; AFFTC-TIM-84-1) Avail: NTIS HC A02/MF A01 CSCL 01/3

This memo describes several changes implemented to the SWIS facility since publication of AFFTC-TIM-77-1. This includes a redesign of the cable attachments, a new length calibration method resulting in a figure of 177.1 in, and a proposed data recording sheet. Examples are presented to aid the user in operational and calibration data reduction. Author (GRA)

N84-28782# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.
A MODEL OF ROTOR BLADE FIRST NATURAL FLAPPING RESPONSE FOR UP TO THREE/REV EXCITATIONS Final Report
J. B. Wilkerson Dec. 1983 26 p
(ARPA Order 4238)

(AD-A141725; DTNSRDC/ASED-83/09) Avail: NTIS HC A03/MF A01 CSCL 01/3

Thus far, all performance calculations for the X-Wing vertical takeoff concept have used a rigid, nonflapping blade analysis. At this stage in the concept development, the flapping degree of freedom should be included for increased accuracy. Thus, a relatively simple set of equations is developed to relate rotor blade aerodynamic moments and blade flapping response which provides rapid evaluation of the blade dynamics and the resulting changes in aerodynamic loading. The relationships between the aerodynamic hinge members and the blade response are derived for the first three harmonics of flapping. Changes in flap damping due to flapping response are accounted for in the equations, which are solved using standard matrix algebra. The equations are validated by comparison with a more sophisticated analytical technique. A case is examined for the critical conversion advance ratio, and the first-order dynamic response is shown for a range of blade natural frequencies. It is shown that a blade natural frequency higher than 2-per-day is desired. Author (GRA)

N84-28783# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

ACTIVE SUPPRESSION OF AEROELASTIC INSTABILITIES FOR FORWARD SWEPT WINGS Final Report, Jan. 1982 - Dec. 1983

T. E. Noll, F. E. Eastep, and R. A. Calico Dec. 1983 170 p Previously announced in IAA as A84-24106

(AF Proj. 2401)

(AD-A141739; AFWAL-TR-84-3002) Avail: NTIS HC A08/MF A01 CSCL 01/1

Analytical studies are conducted to investigate the potential of using active feedback control systems for preventing multiple aeroelastic instabilities (in close proximity) from occurring within the flight envelope of an advanced forward swept wing aircraft. With the addition of wing mounted external stores, the classical bending/torsion flutter instability is driven to lower airspeeds into the vicinity of the aeroelastic instabilities more commonly associated with a forward swept wing (divergence or body freedom flutter). For these studies a typical forward swept wing configuration, adversely mass ballasted to create the dynamic characteristics similar to those caused by adding external stores, is investigated. The goal of this study is to establish concept feasibility so that the technology can be considered for future aircraft application during a design as an alternative or option for preventing aeroelastic instabilities. Analyses are conducted to design active systems for the forward swept wing, cantilevered, free in rigid pitch only, and free in rigid pitch and plunge. They are designed such that both aeroelastic instabilities are suppressed simultaneously to a velocity 20 percent above the unaugmented bending torsion flutter speed with gain margins of at least + or - 6db at this speed conditions. Obtaining large phase margins is also taken into consideration during the design analyses. GRA

N84-28784# Naval Postgraduate School, Monterey, Calif.

THE EFFECT OF COMPONENT REDUNDANCY UPON AIRCRAFT COMBAT SURVIVABILITY M.S. Thesis

A. J. Kangalos Dec. 1983 63 p

(AD-A141815) Avail: NTIS HC A04/MF A01 CSCL 01/3

Aircraft combat survivability has developed into a discipline of its own. This thesis presents a brief overview of the two integral parts of survivability, susceptibility and vulnerability. It examines the probability of an aircraft being killed given a single shot fired by the enemy. It further examines the redundancy of critical components and the effect redundancy has on the probability of kill of the aircraft. Several numerical examples are given. The thesis also examines the Antiaircraft Artillery Simulation Computer Program, and the modifications required in order to introduce component redundancy into it are developed. GRA

N84-28785# Garrett Corp., Los Angeles, Calif. Airesearch Manufacturing Div.

AIRCRAFT FUEL TANK INERTING SYSTEM Final Report, 8 May 1978 - 30 Jul. 1983

R. L. Johnson and J. B. Gillerman Wright-Patterson AFB, Ohio AFWAL Jul. 1983 267 p

(Contract F33615-77-C-2023; AF Proj. 2348)

(AD-A141863; AFWAL-TR-82-2115) Avail: NTIS HC A12/MF A01 CSCL 01/3

The program successfully demonstrated the feasibility of using permeable-membrane, hollow fibers to generate an inert gas to protect the aircraft fuel system against fire and explosion induced by natural sources or combat. The initial contract requirements included a flight demonstration of an onboard inert gas generator system (OBIGGS) using an Air Force KC-135A aircraft. The design of an inert gas generator (IGG) is highly dependent on the flight profile, engine characteristics, and fuel system designs. Mission analysis translated these parameters into an 8 lb/min inert gas generator that produced less than 9-percent oxygen. A life-cycle cost (LCC) analysis compared the state-of-the-art liquid nitrogen (LN2) system utilized on the C-5A aircraft against the IGG system designed for the KC-135A. Results showed the IGG system reduced LCC by 60 percent. Further, the IGG system eliminates the logistic constraints imposed by the use of LN2, thus allowing unrestricted deployment of the aircraft. A second LCC analysis was conducted in which the permeable-membrane system was compared against the blue foam design used on the C-130 aircraft. The LCC analysis shows great advantage for OBIGGS over blue foam. The externally pressurized polymethylene hollow fiber bundles are expected to exceed the 20-year life expectancy of the aircraft. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N84-28786# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

DIGITAL MULTIVARIABLE TRACKER CONTROL LAWS FOR THE KC-135A M.S. Thesis

W. J. Locken Dec. 1983 250 p

(AD-A141118; AFIT/GE/EE/83D-40) Avail: NTIS HC A11/MF A01 CSCL 01/4

Multivariable design technique, developed by Prof. Brian Porter of the Univ. of Salford, England, are used to develop digital control laws for the KC-135A. Control laws are developed for each of three diverse flight conditions. MULTI, a computer program used in the design, is modified to account for computational time delay. The effects of a computational time delay on the controllers developed are presented. The controllers developed, using these techniques, use output feedback with proportional plus integral control. Because of the structure of the system, measurement variables, in addition to the outputs, are necessary. A reduced controller is modeled by setting some of the required feedback gains to zero. A comparison of the results of the reduced controller to the complete controller is presented. A robustness controller is tested by performing specific maneuvers at more than one flight condition. The robust controller is of the reduced form and is required to perform under the constraints of the computational time delay. This thesis concludes that actuator dynamics play a significant role in the development of control laws and, as a result, 2nd order or higher actuator models should be used in future studies. GRA

N84-28787# Dikewood Industries, Inc., Albuquerque, N. Mex.

DESIGN OF INCIDENT FIELD B-DOT SENSOR FOR THE NOSE BOOM OF NASA F-106B AIRCRAFT Final Report, Jun. - Dec. 1983

D. V. Giri and S. H. Sands Kirtland AFB, N. Mex. AFWL Apr. 1984 71 p Prepared in cooperation with LuTech, Inc., Hayward, Calif.

(Contract F29601-82-C-0027; AF Proj. 3763)

(AD-A141765; AFWL-TR-83-141) Avail: NTIS HC A04/MF A01 CSCL 14/2

This report deals specifically with the design considerations of including a B-dot sensor on the existing nose boom of the NASA Langley Research Center experimental F-106B aircraft. Although mounting the B-dot sensor on the existing boom may not be the ideal location, time and aerodynamic constraints require a consideration of sensor placement on the boom. This report also analyzes the performance of a B-dot sensor on the existing boom. The objective of the B-dot sensor is to enable a measurement of the incident B-dot field in the direction of the aircraft axis, in a flyby configuration near the ATHAMAS II (VPD-II) facility. Selected scale-model data useful in supporting the sensor design are included in Appendix B. Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-28788*# Pratt and Whitney Aircraft Group, East Hartford, Conn.

ENERGY EFFICIENT ENGINE HIGH-PRESSURE TURBINE DETAILED DESIGN REPORT

Robert D. Thulin, David C. Howe, and Irwin D. Singer Jan. 1982 164 p refs

(Contract NAS3-20646)

(NASA-CR-165608; NAS 1.26:165608; PWA-5594-171) Avail: NTIS HC A08/MF A01 CSCL 21E

The energy efficient engine high-pressure turbine is a single stage system based on technology advancements in the areas of aerodynamics, structures and materials to achieve high performance, low operating economics and durability commensurate with commercial service requirements. Low loss performance features combined with a low through-flow velocity approach results in a predicted efficiency of 88.8 for a flight propulsion system. Turbine airfoil durability goals are achieved through the use of advanced high-strength and high-temperature capability single crystal materials and effective cooling management. Overall, this design reflects a considerable extension in turbine technology that is applicable to future, energy efficient gas-turbine engines. Author

N84-28789*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.

ENERGY EFFICIENT ENGINE: TURBINE INTERMEDIATE CASE AND LOW-PRESSURE TURBINE COMPONENT TEST HARDWARE DETAILED DESIGN REPORT

K. Leach, R. D. Thulin, and D. C. Howe Jan. 1982 288 p refs

(Contract NAS3-20646)

(NASA-CR-167973; NAS 1.26:167973; PWA-5594-191) Avail: NTIS HC A13/MF A01 CSCL 21E

A four stage, low pressure turbine component has been designed to power the fan and low pressure compressor system in the Energy Efficient Engine. Designs for a turbine intermediate case and an exit guide vane assembly also have been established. The components incorporate numerous technology features to enhance efficiency, durability, and performance retention. These designs reflect a positive step towards improving engine fuel efficiency on a component level. The aerodynamic and thermal/mechanical designs of the intermediate case and low pressure turbine components are presented and described. An overview of the predicted performance of the various component designs is given. R.S.F.

N84-28790*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

VELOCITY AND TEMPERATURE CHARACTERISTICS OF TWO-STREAM, COPLANAR JET EXHAUST PLUMES

Uwe H. vonGlahn, J. Goodykoontz, and C. Wasserbauer 1984 39 p refs Presented at the 2nd Appl. Aerodyn. Conf., Seattle, 21-23 Aug. 1984; sponsored by AIAA

(NASA-TM-83730; E-2205; NAS 1.15:83730; AIAA-84-2205) Avail: NTIS HC A03/MF A01 CSCL 21E

The subsonic jet exhaust velocity and temperature characteristics of model scale, two stream coplanar nozzles were obtained experimentally. The data obtained included the effects of fan to primary stream velocity and temperature ratios on the jet axial and radial flow characteristics. Empirical parameters were developed to correlate the measured data. The resultant equations were shown to be extensions of a previously published single stream jet velocity and temperature correlation. Author

N84-28791*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AN OVERVIEW OF THE NASA ROTARY ENGINE RESEARCH PROGRAM

Phillip R. Meng and William F. Hady 1984 26 p refs Presented at the West Coast Intern. Meeting, San Diego, Calif., 6-9 Aug. 1984; sponsored by SAE

(NASA-TM-83699; E-2157; NAS 1.15:83699) Avail: NTIS HC A03/MF A01 CSCL 21E

A brief overview and technical highlights of the research efforts and studies on rotary engines over the last several years at the NASA Lewis Research Center are presented. The test results obtained from turbocharged rotary engines and preliminary results from a high performance single rotor engine were discussed. Combustion modeling studies of the rotary engine and the use of a Laser Doppler Velocimeter to confirm the studies were examined. An in-house program in which a turbocharged rotary engine was installed in a Cessna Skymaster for ground test studies was reviewed. Details are presented on single rotor stratified charge rotary engine research efforts, both in-house and on contract. Author

N84-28792*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.

PRELIMINARY FLIGHT EVALUATION OF F100 ENGINE MODEL DERIVATIVE AIRSTART CAPABILITY IN AN F-15 AIRPLANE

Tony K. Cho and Frank W. Burcham, Jr. Jul. 1984 31 p refs Prepared in cooperation with NASA. Ames Research Center

(NASA-TM-86031; H-1200; NAS 1.15:86031) Avail: NTIS HC A03/MF A01 CSCL 21E

A series of airstarts was conducted in an F-15 airplane with two prototype F100 engine model derivative (EMD) engines equipped with digital electronic engine control (DEEC) systems. The airstart envelope and time required for airstarts were defined. The success of an airstart is most heavily dependent on airspeed. Spooldown airstarts at 200 knots and higher were all successful. Spooldown airstart times ranged from 53 sec at 250 knots to 170 sec at 175 knots. Jet fuel starter (JFS) assisted airstarts were conducted at 175 knots at two altitudes, and airstart times were 50 and 60 sec, significantly faster than unassisted airstart. The effect of altitude on airstarts was small. In addition, the airstart characteristics of the two test engines were found to closely resemble each other. The F100 EMD airstart characteristics were very similar to the DEEC equipped F100 engine tested previously. Finally, the time required to spool down from intermediate power compressor rotor speed to a given compressor rotor speed was found to be a strong function of altitude and a weaker function of airspeed. Author

N84-28793*# National Aeronautics and Space Administration, Washington, D. C.

GROWIAN ROTOR BLADES: PRODUCTION DEVELOPMENT, CONSTRUCTION AND TEST

Hans Martin Thiele Jul. 1984 80 p refs Transl. into ENGLISH of "Growian Rotorblatter: Fertigungsentwicklung, Bau und Test" rept. BMFT-FB-T-83-111 BMFT, Bonn, Jun. 1983 p 1-76 Original language was announced as N84-11526 Transl. by Scientific

Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77479; NAS 1.15:77479; BMFT-FB-T-83-111) Avail: NTIS HC A05/MF A01 CSCL 21E

Development and construction of three 50 m rotor blades for a 3 MW wind turbine are described. A hybrid concept was chosen, i.e., a load carrying inflexible steel spar and a glass fiber reinforced plastic skin. A test blade was constructed and static loading tests, dynamic vibration tests and fatigue tests on critical welds as well as at the connection between spar and blade skin were performed. All test results show good accordance with calculated values, and were taken into consideration during the construction of two rotor blades. Author (IAA)

N84-28794*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mechanical and Aerospace Engineering.
DILUTION JETS IN ACCELERATED CROSS FLOWS Ph.D. Thesis Final Report
Abraham Lipshitz and Isaac Greber Jun. 1984 315 p refs
(Grant NsG-3206)
(NASA-CR-174717; NAS 1.26:174717) Avail: NTIS HC A14/MF A01 CSCL 21E

Results of flow visualization experiments and measurements of the temperature field produced by a single jet and a row of dilution jets issued into a reverse flow combustor are presented. The flow in such combustors is typified by transverse and longitudinal acceleration during the passage through its bending section. The flow visualization experiments are designed to examine the separate effects of longitudinal and transverse acceleration on the jet trajectory and spreading rate. A model describing a dense single jet in a lighter accelerating cross flow is developed. The model is based on integral conservation equations, including the pressure terms appropriate to accelerating flows. It uses a modified entrainment correlation obtained from previous experiments of a jet in a cross stream. The flow visualization results are compared with the model calculations in terms of trajectories and spreading rates. Each experiment is typified by a set of three parameters: momentum ratio, density ratio and the densimetric Froude number. M.A.C.

N84-28795*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DETAILED FLOW MEASUREMENTS IN CASING BOUNDARY LAYER OF 429-METER-PER-SECOND-TIP-SPEED TWO-STAGE FAN
William T. Gorrell Jan. 1984 33 p refs Prepared in cooperation with Army Aviation Research and Development Command, Cleveland
(NASA-TP-2052; E-219; NAS 1.60:2052;
AVRADCOM-TR-81-C-28) Avail: NTIS HC A03/MF A01 CSCL 21E

Detailed flow measurements between all blade rows were taken in the outer 30 percent of passage height of a two stage fan. Tabulations of the detailed flow measurements are included. Results of these measurements revealed the steep axial velocity profiles near the casing. The axial velocity profile near the casing at the rotor exists was much steeper than at the stator exits. The data also show overturning of the flow at the tip at the stator exits. The effect of mixing is shown by the redistribution of the first stage rotor exit total temperature profile as it passes through the following stator. Author

N84-28796# TRW Space Technology Labs., Redondo Beach, Calif. Engineering Sciences Lab.
WALL EFFECTS ON COMBUSTION IN AN ENGINE Final Report, 15 Mar. 1983 - 14 May 1984
F. E. Fendell 14 May 1984 9 p
(Contract DAAG29-83-C-0010)
(AD-A141418; TRW-S/N-41354.000; ARO-19972.4-EG) Avail: NTIS HC A02/MF A01 CSCL 21/7

This project utilized theoretical modeling and laboratory experiment to elucidate the role of chamber shaping on the combustion event in a four-stroke-cycle, reciprocating-piston-type internal-combustion-engine cylinder. First, theoretical modeling was carried out to evaluate heat transfer as a determent of end-gas knock during nonisobaric flame propagation across a homogeneous charge in a variable-volume enclosure. Via a semi-empirical model, turbulent combustion in an automotive cylinder was considered; a three-zone generalization (to encompass end gas, unburned bulk gas and burned gas) of the standard two-zone Otto-cycle-combustion model was developed. Via a selfcontained model, laminar combustion in a specially designed rapid-compression machine was considered; an asymptotic analysis valid in the limit of large Arrhenius activation temperature was developed. For given operating conditions, the fraction of the charge (if any) that undergoes autoconversion to product prior to flame arrival can be ascertained, along with the heat transfer sufficient to preclude such homogeneous explosion. Second, two-wall, or crevice-type, quenching of flame propagation through a stoichiometric or fuel-lean hydrocarbon-air-type premixture is examined because this phenomenon is now believed to be the major source of unburned-hydrocarbon emissions from homogeneous-charge engines. GRA

N84-28797# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
STATOR BLADE ROW GEOMETRY MODIFICATION INFLUENCE ON TWO-STAGE, AXIAL-FLOW COMPRESSOR AERODYNAMIC PERFORMANCE Technical Report, 1 Oct. 1978 - 30 Apr. 1983
D. L. Tweedt and T. H. Okiishi Air Force Office of Scientific Res., Wash., D.C. Dec. 1983 260 p
(Contract F49620-83-K-0023; AF Proj. 2307)
(AD-A141793; ISU-ERI-AMES-84179; TCRL-25;
AFOSR-84-0418TR) Avail: NTIS HC A12/MF A01 CSCL 21/5

The influence of stator row geometry modification on the aerodynamic performance of a two-stage, low-speed, axial-flow research compressor was assessed in the experiments described in this project. Stator geometry modifications tested included stator leading edge forward symmetrical sweep, large-radius blade/annulus wall corner fillets, and stator hub gap sealing (shrouding). Comparisons were made between detailed aerodynamic data associated with baseline and modified configurations. Substantial stator exit flow-field changes attributable to symmetrical sweeping of stator leading edges and to hub clearance sealing were observed with some evidence of corresponding near end wall loss reduction. The effects of large radii filleting were less clear. Interesting conclusions about the off-design flow rate performance of the compressor also resulted from consideration of experimental data. Author (GRA)

N84-28798# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
AERODYNAMIC DESIGN AND PERFORMANCE OF A TWO-STAGE, AXIAL-FLOW COMPRESSOR (BASELINE) Technical Report, 1 Oct. 1978 - 30 Nov. 1982
M. D. Hathaway and T. H. Okiishi Dec. 1983 204 p
(Contract F49620-83-K-0023; AF Proj. 2307)
(AD-A141796; ISU-ERI-AMES-84178; TCRL-24;
AFOSR-84-0417TR) Avail: NTIS HC A10/MF A01 CSCL 21/5

A two-stage, baseline configuration, low-speed, axial-flow research compressor was designed, built and tested at design flow. The design, fabrication and data acquisition and reduction details are described. Time-averaged, spatially detailed and overall flow and aerodynamic performance data for design flow operation of the compressor are presented and discussed. Author (GRA)

N84-28799# SRI International Corp., Menlo Park, Calif.
BASIC STUDY OF FUEL STORAGE STABILITY Final Report, 15 Jul. 1980 - 31 Mar. 1984
F. R. Mayo May 1984 13 p
(Contract DAAG29-80-C-0122)
(AD-A142194; ARO-17062.5-EG) Avail: NTIS HC A02/MF A01 CSCL 21/5

The goal of this program was to determine the chemistry of deposit formation on hot parts of diesel and jet turbine engines and thus to predict and prevent deposit formation. These deposits

are assumed to come mostly from soluble gum formed on storage. The fuels used for the study were distilled at low pressure and stored under nitrogen and refrigeration. We measured rates of oxygen absorption from air, R sub 0 and total gum formation, r sub g at 130 C without initiator and at 100 with added t-Bu202. The gum measured was mostly or wholly soluble in the fuel; insoluble gum, if any, was a minor product. Author (GRA)

N84-28800# Lanchester Polytechnic, Coventry (England). Dept. of Mechanical Engineering.
A DIAGNOSTIC TECHNIQUE FOR IMPROVING COMBUSTOR PERFORMANCE
B. L. Button and P. R. S. White 1982 11 p refs Presented at 2nd Polytech. Symp. on Thermodyn. and Heat Transfer, Leicester, England, Nov. 1982 Sponsored by United Kingdom Ministry of Defence Procurement Executive
Avail: NTIS HC A02/MF A01

A technique for monitoring airflow and fuel distribution within the primary zone of a gas turbine combustor was described. A carbon monoxide tracer gas was injected into the flow to be examined in order to seed the primary air or simulate the fuel flow. The subsequent distribution was obtained using an accurately positioned sampling probe feeding an infra red analyzer. Results were verified by running a combustor under full load conditions. Author (ESA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N84-28801*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE SHUTTLE SEPARATE-SURFACE CONTROL-SYSTEM STUDY
Lawrence W. Brown and Raymond C. Montgomery Jul. 1984 59 p refs
(NASA-TP-2340; L-15650; NAS 1.60:2340) Avail: NTIS HC A04/MF A01 CSCL 01C

A control system concept is presented that produces proportional control of yaw moment for the space shuttle from early entry to Mach 2 with only software modifications of the vehicle. It uses separate deflections of the inboard and outboard elevon surfaces and is evaluated, by determining the maximum static yawing moment available by considering the deflection limits of the elevon surfaces. A proportional moment slightly in excess of that produced by the most effective reaction control system (RCS) jet for yaw control can be obtained. In addition to the static moment study, a control law is designed which is intended to produce desired flying qualities. M.A.C.

N84-28802*# Boeing Commercial Airplane Co., Seattle, Wash. Preliminary Design Dept.
INTEGRATED APPLICATION OF ACTIVE CONTROLS (IAAC) TECHNOLOGY TO AN ADVANCED SUBSONIC TRANSPORT PROJECT: CURRENT AND ADVANCED ACT CONTROL SYSTEM DEFINITION STUDY, VOLUME 1 Final Report, Jul. 1978 - Oct. 1980
G. W. Hanks, H. A. Shomber, H. A. Dethman, L. B. Gratzer, A. Maeshiro, D. Gangsaas, J. D. Blight, S. M. Buchan, C. B. Crumb, R. J. Dorwart et al Oct. 1981 521 p refs
(Contracts NAS1-14742; NAS1-15325)
(NASA-CR-165631-Vol-1; NAS 1.26:165631-Vol-1; D6-48673-Vol-1) Avail: NTIS HC A22/MF A01 CSCL 01C

An active controls technology (ACT) system architecture was selected based on current technology system elements and optimal control theory was evaluated for use in analyzing and synthesizing ACT multiple control laws. The system selected employs three redundant computers to implement all of the ACT functions, four redundant smaller computers to implement the crucial pitch-augmented stability function, and a separate maintenance and display computer. The reliability objective of probability of crucial function failure of less than 1 x 10 to the -9th power per flight of 1 hr can be met with current technology system components, if the software is assumed fault free and coverage approaching 1.0 can be provided. The optimal control theory approach to ACT control law synthesis yielded comparable control law performance much more systematically and directly than the classical s-domain approach. The ACT control law performance, although somewhat degraded by the inclusion of representative nonlinearities, remained quite effective. Certain high-frequency gust-load alleviation functions may require increased surface rate capability. A.R.H.

N84-28803*# Boeing Commercial Airplane Co., Seattle, Wash.
INTEGRATED APPLICATION OF ACTIVE CONTROLS (IAAC) TECHNOLOGY TO AN ADVANCED SUBSONIC TRANSPORT PROJECT: CURRENT AND ADVANCED ACT CONTROL SYSTEM DEFINITION STUDY. VOLUME 2: APPENDICES Final Report
G. W. Hanks, H. A. Shomber, H. A. Dethman, L. B. Gratzer, A. Maeshiro, D. Gangsaas, J. D. Blight, S. M. Buchan, C. B. Crumb, and R. J. Dorwart Oct. 1981 542 p refs
(Contracts NAS1-14742; NAS1-15325)
(NASA-CR-165631-Vol-2; NAS 1.26:165631-Vol-2) Avail: NTIS HC A23/MF A01 CSCL 01C

The current status of the Active Controls Technology (ACT) for the advanced subsonic transport project is investigated through analysis of the systems technical data. Control systems technologies under examination include computerized reliability analysis, pitch axis fly by wire actuator, flaperon actuation system design trade study, control law synthesis and analysis, flutter mode control and gust load alleviation analysis, and implementation of alternative ACT systems. Extensive analysis of the computer techniques involved in each system is included. M.A.C.

N84-28804*# Boeing Commercial Airplane Co., Seattle, Wash. Preliminary Design Dept.
INTEGRATED APPLICATION OF ACTIVE CONTROLS (IAAC) TECHNOLOGY TO AN ADVANCED SUBSONIC TRANSPOT PROJECT-DEMONSTRATION ACT SYSTEM DEFINITION Final Report, Nov. 1980 - Jun. 1981
G. W. Hanks, H. A. Shomber, C. B. Crumb, C. C. Flora, K. A. B. Macdonald, R. D. Smith, A. P. Sassi, and R. J. Dorwart Aug. 1982 67 p refs
(Contract NAS1-15325)
(NASA-CR-165920; NAS 1.26:165920; D6-51148) Avail: NTIS HC A04/MF A01 CSCL 01C

The 1985 ACT airplane is the Final Active Controls Technology (ACT) Airplane with the addition of three-axis fly by wire. Thus it retains all the efficiency features of the full ACT system plus the weight and cost savings accruing from deletion of the mechanical control system. The control system implements the full IAAC spectrum of active controls except flutter-mode control, judged essentially nonbeneficial, and incorporates new control surfaces called flaperons to make the most of wing-load alleviation. This redundant electronic system is conservatively designed to preserve the extreme reliability required of crucial short-period pitch augmentation, which provides more than half of the fuel savings. Author

N84-28805*# Lockheed-California Co., Burbank.
DEVELOPMENT AND FLIGHT EVALUATION OF AN AUGMENTED STABILITY ACTIVE CONTROLS CONCEPT WITH A SMALL HORIZONTAL TAIL Report, Dec. 1978 - Apr. 1982
J. J. Rising, A. A. Kairys, C. A. Maass, C. D. Siegart, W. L. Rakness, R. D. Mijares, R. W. King, R. S. Peterson, S. R. Hurley, D. Wickson et al Hampton, Va. NASA. Langley Research Center 1 Sep. 1982 182 p refs
(Contract NAS1-15326)
(NASA-CR-165951; NAS 1.26:165951; LR-30208-2) Avail: NTIS HC A09/MF A01 CSCL 01C

A limited authority pitch active control system (PACS) was

developed for a wide body jet transport (L-1011) with a flying horizontal stabilizer. Two dual channel digital computers and the associated software provide command signals to a dual channel series servo which controls the stabilizer power actuators. Input sensor signals to the computer are pitch rate, column-trim position, and dynamic pressure. Control laws are given for the PACS and the system architecture is defined. The piloted flight simulation and vehicle system simulation tests performed to verify control laws and system operation prior to installation on the aircraft are discussed. Modifications to the basic aircraft are described. Flying qualities of the aircraft with the PACS on and off were evaluated. Handling qualities for cruise and high speed flight conditions with the c.g. at 39% mac (+ 1% stability margin) and PACS operating were judged to be as good as the handling qualities with the c.g. at 25% (+15% stability margin) and PACS off. Author

N84-28806*# Sikorsky Aircraft, Stratford, Conn.
UH-60A BLACK HAWK ENGINEERING SIMULATION PROGRAM. VOLUME 1: MATHEMATICAL MODEL Final Report
J. J. Howlett Dec. 1981 359 p refs
(Contract NAS2-10626)
(NASA-CR-166309; NAS 1.26:166309; SER-70452) Avail: NTIS HC A16/MF A01 CSCL 01C

A nonlinear mathematical model of the UR-60A Black Hawk helicopter was developed. This mathematical model, which was based on the Sikorsky General Helicopter (Gen Hel) Flight Dynamics Simulation, provides NASA with an engineering simulation for performance and handling qualities evaluations. This mathematical model is total systems definition of the Black Hawk helicopter represented at a uniform level of sophistication considered necessary for handling qualities evaluations. The model is a total force, large angle representation in six rigid body degrees of freedom. Rotor blade flapping, lagging, and hub rotational degrees of freedom are also represented. In addition to the basic helicopter modules, supportive modules were defined for the landing interface, power unit, ground effects, and gust penetration. Information defining the cockpit environment relevant to pilot in the loop simulation is presented. Author

N84-28807*# Honeywell Systems and Research Center, Minneapolis, Minn.
INTERACTIVE FLIGHT CONTROL SYSTEM ANALYSIS PROGRAM Final Report
J. K. Mahesh, A. F. Konar, and M. D. Ward Jun. 1984 20 p refs
(Contract NAS1-16438)
(NASA-CR-172352; NAS 1.26:172352; Rept-84SRC10) Avail: NTIS HC A02/MF A01 CSCL 01C

A summary of the development, use, and documentation of the interactive software (DIGIKON IV) for flight control system analyses is presented. A list of recommendations for future development is also included. Author

N84-28808*# National Aeronautics and Space Administration, Washington, D. C.
DESIGN OF WIND SHEAR FILTERS
H. Joerck May 1984 17 p refs Transl. into ENGLISH from "Auslegung von Scherwindfiltern" Brunswick, IN: Sonderforschungsbereich Flugfuehrung, Kolloq., 1982 p 261-276 Original language doc. was announced as A83-26483 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Techniche Univ., Brunswick, West Germany
(Contract NASw-3542)
(NASA-TM-77460; NAS 1.15:77460) Avail: NTIS HC A02/MF A01 CSCL 01C

A number of aircraft accidents are caused by the effects of wind shear. In connection with efforts to eliminate or reduce hazards leading to such accidents, the possibility was considered to improve aircraft control systems. However, the effective implementation of the considered approaches will only be possible if suitable filters can be designed for a separation of gusts, which involve higher frequencies from low-frequency wind shear components. Filters of appropriate design should be suited for an employment in connection with all flight conditions. Feasible approaches for obtaining such filters are discussed. A survey is provided regarding the order of magnitude of the improvements which can be achieved, taking into account the performance characteristics of the A300 controller. R.J.F.

N84-28809*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A REVIEW OF US ARMY AIRCREW-AIRCRAFT INTEGRATION RESEARCH PROGRAMS
David C. Key and Edwin W. Aiken Jul. 1984 18 p refs Prepared in cooperation with Army Research and Technology Labs., Moffett Field, Calif.
(NASA-TM-85947; A-9717; NAS 1.15:85947; USAAVSCOM-TM-84-A-5) Avail: NTIS HC A02/MF A01 CSCL 01C

If the U.S. Army's desire to develop a one crew version of the Light Helicopter Family (LHX) helicopter is to be realized, both flightpath management and mission management will have to be performed by one crew. Flightpath management, the helicopter pilot, and the handling qualities of the helicopter were discussed. In addition, mission management, the helicopter pilot, and pilot control/display interface were considered. Aircrew-aircraft integration plans and programs were reviewed. R.S.F.

N84-28810# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
DEVELOPMENT OF LATERAL-DIRECTIONAL EQUIVALENT SYSTEM MODELS FOR SELECTED U.S. NAVY TACTICAL AIRCRAFT Final Report, 1 Oct. 1981 - 30 Nov. 1982
D. E. Bischoff and R. E. Palmer Sep. 1983 100 p
(AD-A141672; NADC-83116-60) Avail: NTIS HC A05/MF A01 CSCL 01/3

The high order transfer functions representing the lateral directional responses to pilot control inputs were matched with low order equivalent forms in the frequency domain for five Navy tactical aircraft: the A-6, A-7, S-3, F-14, and F-18. The candidate low order equivalent forms investigated were: (1) the complete three degree of freedom representation of roll and sideslip angle responses, and (2) the single degree of freedom roll mode and Dutch roll approximations. Acceptable models were generally obtained for both forms. Simultaneous matching of sideslip and roll angle responses and/or apriori information for the roots was required to match the full three degree of freedom forms. The equivalent system models are discussed in terms of their match statistics. The equivalent system modal parameters, when compared against the requirements of the military flying qualities specification, demonstrate level 1 flying qualities for the conditions analyzed with the exception of roll angle time delay for the A-7 and F-18 airplanes. The A-7's lateral command augmentation structure results in Level 2-3 equivalent time delays, while the F-18's control force inputs produce level 2 equivalent time delays. Author (GRA)

N84-28811# Vereinigte Flugtechnische Werke G.m.b.H., Bremen (West Germany).
UNSTEADY AERODYNAMICS OF MOVING CONTROL SURFACES AT THE AIRBUS WING Final Report, Jan. 1983
Gerhard Anders Bonn Bundesministerium fuer Forschung und Technologie Mar. 1984 23 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-001; ISSN-0170-1339) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5

Steady and unsteady tests were carried out in a transonic tunnel on moving control surfaces of the European Airbus wing. A data bank containing the measured configurations of spoilers, flaps, and ailerons is obtained. Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N84-28812# Federal Aviation Agency, Atlantic City, N.J.
IDENTIFICATION OF EXIT TAXIWAYS (RETROFLECTIVE MARKERS ONLY) Final Report, Mar. 1981 - Oct. 1982
Larry W. Hackler Apr. 1983 35 p refs
(FAA-CT-83-5; FAA-RD-82-91) Avail: NTIS HC A03/MF A01

The purpose of the exit taxiway lighting is to enable the pilot to expeditiously exit from the runway to a taxiway. There is evidence that this was not satisfactorily accomplished by the present lighting for short-radius exit taxiways. The use of surface retroreflective markers for identifying short-radius exit taxiways at night was evaluated. The markers are intended for locations where the cost of inset centerline lighting cannot be justified. The results indicate that there was an improvement in the pilots ability to identify the exit taxiway associated with the exit-taxiway retroreflectors. The results also show that the retroreflectors should be placed on an arc from near the runway centerline to the taxiway centerline using a cord spacing of 12.5 feet (4 meters). Author

N84-28813# National Aerospace Lab., Tokyo (Japan).
NATIONAL AEROSPACE LABORATORY, 1982
1982 28 p refs In JAPANESE
Avail: NTIS HC A03/MF A01

The National Aerospace Laboratory (NAL) of Japan is described. Topics include facility history, organization, operating budget, research projects, and research facilities. Emphasis is placed on low noise, fan jet STOL aircraft, liquid oxygen and hydrogen rocket engines, high pressure liquid fuel turbopump systems, gas turbine engine design, and satellite remote sensing research. M.A.C.

N84-28814*# National Aeronautics and Space Administration, Washington, D. C.
THE F2 WIND TUNNEL AT FAUGA-MAUZAC
D. Afchain, P. Broussaud, M. Frugier, and G. Rancarani May 1984 39 p refs Transl. into ENGLISH of "La Soufflerie F2 du Centre du Faufa-Mauzac" rept. ONERA-TP-1983-139 ONERA, Chatillon, France, 1983 p 1-29 Presented at the 20th Coiloq. d'Aerodyn. Appl., Toulouse, 8-10 Nov. 1983 Original language document was announced as A84-19928
(Contract NASw-3541)
(NASA-TM-77482; NAS 1.15:77482) Avail: NTIS HC A03/MF A01 CSCL 14B

Details on the French subsonic wind-tunnel F2 that becomes operational on July 1983 are presented. Some of the requirements were: (1) installation of models on any wall of the facility, (2) good observation points due to transparent walls, (3) smooth flow, (4) a laser velocimeter, and (5) easy access and handling. The characteristics include a nonpressurized return circuit, dimensions of 5 x 1.4 x 1.8 m, maximum velocity of 100 m/s and a variable speed fan of 683 kW. Author (IAA)

N84-28815# Federal Aviation Administration, Washington, D.C. Program Engineering and Maintenance Service.
THE PERFORMANCE OF CIVIL AIRPORT PAVEMENT WITH LIME-CEMENT-FLYASH BASE COURSE Final Report
Aston L. McLaughlin Apr. 1984 23 p refs
(FAA-PM-84-10) Avail: NTIS HC A02/MF A01

The background and application of lime, cement and flyash are reviewed in order to explain the performance of civil aviation airport pavements constructed with lime-cement-flyash as a base course. The report states that performance of these pavements has been good and that the state of the art presently provides experimental techniques and laboratory tests to assure an economical and safe design. It is observed that many of the problems are associated with environmental forces and long-term behavior of the materials. A recommendation is that long-term performance together with the effectiveness of any remedial measures should be systematically monitored and catalogued so that any needed changes in the technology can be identified. Also, construction procedures and specifications limits can now be provided to the airport pavement engineering community on the basis of existing data and additional laboratory investigations. Author

N84-28816# Navy Experimental Diving Unit, Panama City, Fla.
EVALUATION OF A CARBON DIOXIDE SCRUBBER IN A 2-LOCK RECOMPRESSION CHAMBER Final Report
H. J. C. Schwartz, P. H. Robinson, D. K. Schram, and A. J. Sarich Mar. 1984 23 p
(AD-A141052; NEDU-6-84) Avail: NTIS HC A02/MF A01 CSCL 06/11

An unmanned study of a carbon dioxide scrubber in a standard U.S. Navy two-lock recompression chamber is presented. Tests were conducted at the Navy Experimental Diving Unit to determine canister air flows and durations at various depths and initial carbon dioxide concentrations, using a Kinergetics, Incorporated Scrubber, Model DH-10. Air flows were 262 LPM, 274 LPM, and 270 LPM, at 15 FWS, 30 FSW, and 60 FSW respectively. For the canister duration studies an initial load of carbon dioxide was introduced into the chamber, then carbon dioxide was added to the chamber at a rate of 2 standard liters per minute to simulate 3 human occupants. Canister durations under steady state conditions of a long treatment were estimated to be 3.46 hours at 30 FSW, 1.89 hours at 60 FSW, and 1.16 hours at 165 FSW. Author (GRA)

N84-28817# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
RESPONSE AND PERFORMANCE OF CONTINGENCY AIRFIELD PAVEMENTS CONTAINING STABILIZED MATERIAL LAYERS Ph.D. Thesis
R. R. Costigan Apr. 1984 269 p
(AD-A141466; AFIT/CI/NR-84-9D) Avail: NTIS HC A12/MF A01 CSCL 13/2

The purpose of this study was to validate the mechanistic approach for the design and evaluation of Contingency Airfield Pavements (CAPs) containing stabilized material layers. The mechanistic approach was validated by relating predicting first pass structural response parameters (stress and strain) to observed performance of field test items. Major study findings included: (1) Subgrade characteristics control performance in pavements with predicted first pass crack stress ratio greater than one, (2) CAPs should be designed and evaluating using an intact slab concept, (3) Design of CAPs should be based on stress or strain ratios less than one, (4) The presence of a crushed stone base course over a stabilized subbase course in an inverted pavement has a bridging effect at transfer cracks in the stabilized subbase and inhibits the rate of crack propagation to the surface. GRA

N84-28818# Florida State Univ., Gainesville. Dept. of Civil Engineering.
CENTRIFUGAL SCALING LAWS FOR GROUND LAUNCH CRUISE MISSILE SHELTER Final Report, 1 Jul. - 31 Dec. 1983
D. M. Bradley, F. C. Townsend, F. E. Fagundo, and J. L. Davidson Apr. 1984 95 p
(Contract F08635-83-C-0136; AF Proj. 2673)
(AD-A141572; AFESC/ESL-TR-84-07) Avail: NTIS HC A05/MF A01 CSCL 13/13

This report summarizes the feasibility of, and scaling relationships for, centrifugal modelling of the GLCM shelter. Similitude between model and prototype is deemed possible if constitutively similar reinforced concrete and soil are used in the model. However, currently available US centrifuges limit GLCM shelter model scales to 1/150 to 1/300, which causes difficulties in model construction with microconcrete and miniaturized reinforcement. Therefore,

centrifugal modelling of GLCM components, coupled with computer analyses, is recommended. Author (GRA)

N84-28819# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
BOMB DAMAGE REPAIR: PRECAST SLAB DESIGN Final Technical Report, Oct. 1981 - Mar. 1983
W. N. Brabston Apr. 1984 124 p
(Contract MIRP-N-82-40; AF Proj. 2612)
(AD-A141687; AFESC/ESL-TR-84-21) Avail: NTIS HC A06/MF A01 CSCL 01/5

A study was made to evaluate various methods of rapid repair of bomb craters on runways using precast concrete slabs as structural elements. Primary focus was on optimum utilization of the concrete slabs when placed on debris backfill and on compacted select material backfill. Three primary repair concepts were studied: placement of slabs flush with the surrounding pavement and interlocked at the edges with concrete grout (Flush Slab Method); placement of slabs slightly below the surrounding pavement and surfaced with a 2-inch thick concrete cap screeded flush with the old pavement (Submerged Slab Method); and placement of the slab flush with the old pavement with no-load transfer mechanism (German Method). Analyses were made of the various repair methods based on estimated time of repair and on expected structural response under aircraft loading. Time estimates were subdivided into time elements for the major repair tasks. Structural analyses were conducted with layered elastic and modified finite element computer codes. Repair methods evaluated as having most potential for development as standard procedures were those involving use of slabs submerged in a capped-concrete matrix. Analyses indicated that the other two methods offered less potential for future development. It was recommended that field tests be conducted to further evaluate all three methods. Author (GRA)

N84-28820# School of Aerospace Medicine, Brooks AFB, Tex.
HYPERBARIC CHAMBER EQUIPMENT: A CONSOLIDATED EQUIPMENT LIST FROM SELECTED MULTIPLACE HYPERBARIC FACILITIES Final Report, 10 Oct. 1982 - 15 May 1983
P. J. Sheffield and S. E. Piwinski Dec. 1983 25 p
(AF Proj. HM88)
(AD-A141702; USAFSAM-TR-83-34) Avail: NTIS HC A02/MF A01 CSCL 14/2

The objective of this report is to provide a list of equipment applicable to clinical hyperbaric chambers. Information from this document would be used in planning the equipment required for future clinical facilities. Twenty-two responses from multiplace clinical hyperbaric facilities in the United States and Canada provided the information contained in this consolidated list of chamber monitoring and ancillary support equipment and medical support equipment. Chamber monitoring and ancillary equipment included gas/vapor monitoring equipment, carbon dioxide scrubbers, air conditioning, communications, lighting, and fire detecting and fire extinguishing systems. Medical support equipment was limited to patient monitoring equipment, automatic ventilators, and chamber cleaning/sterilization. Some items must be adapted with special devices (such as nitrogen purging) in order to be used in hyperbaric environment. Wherever possible, the source of equipment (manufacturer and address) is provided. GRA

N84-28821# General Accounting Office, Washington, D. C. Resources Community and Economic Development Div.
STUDIES OF US UNIVERSITIES' RESEARCH EQUIPMENT NEEDS INCONCLUSIVE
3 Apr. 1984 23 p
(AD-A141784; AD-E750818; GAO/RCED-84-105) Avail: NTIS HC A02/MF A01 CSCL 14/2

In 1982, various scientific leaders estimated that the cost to update university research equipment was between $1 billion and $4 billion. Because of this large cost variance, GAO was requested to assess how well past studies have defined the nationwide deficiency in university research equipment and to suggest what other work is needed to better determine equipment needs. GAO examined five completed studies that described the status of university equipment needs and two such studies which are still in progress. Although each completed study stated that universities have had a substantial need for equipment, none of these studies can be used to determine current needs. This report analyzes studies and other relevant data to determine the causes and factors which influence universities' need for research equipment and identify and evaluate options for equipping university laboratories. GRA

N84-28822# Naval Postgraduate School, Monterey, Calif.
PROPOSAL AND DEVELOPMENT PLAN FOR AN AIRCRAFT SYSTEMS INTEGRATION LABORATORY M.S. Thesis
R. W. Iler Dec. 1983 52 p
(AD-A141827) Avail: NTIS HC A04/MF A01 CSCL 01/3

This paper presents a proposal and a plan for the development of an aircraft systems intergration laboratory (ASIL) in the Department of Aeronautics at the Naval Postgraduate School. The paper addresses the current and future benefits of and requirements for the laboratory in the areas of research and education, describes the capabilities of the proposed laboratory, presents a plan for its development, details the costs involved, and outlines the support required for construction and operation. The purpose of the laboratory will be to conduct research in the man machine interface problems with aerospace systems and to facilitate the education of Naval aviation officers in the complexities of modern aircraft systems integration. GRA

N84-29665*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A COMPARISON OF WIND TUNNELS SUITABLE FOR ROTORCRAFT NOISE STUDIES
Paul T. Soderman *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 45-62 (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 14B

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N84-28823# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE
14 Jun. 1984 127 p Transl. into ENGLISH from various Russian articles
(JPRS-USP-84-003) Avail: NTIS HC A07

This serial report contains news items, abstracts and articles of scientific reports on aspects of space including manned mission highlights, space science, interplanetary sciences, life sciences, space applications, space policy and administration, and launch tables. For individual titles, see N84-28824 through N84-28880.

N84-28824# Joint Publications Research Service, Arlington, Va.
MANNED FLIGHT CHRONOLOGY
In its USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 1-4 Transl. into ENGLISH from TASS (USSR), n.d. (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The rendezvous of the Soyuz T-10 with the Salyut-7 was performed automatically and the docking manually. Highlights of the cosmosnauts schedule was presented. A series of medical experiments were performed to further study the mechanisms of vestibular disorders in the acute period of adaptation to weightlessness and to evaluate the effectiveness of prophylactic measures. B.G.

N84-28825# Joint Publications Research Service, Arlington, Va.
COMMENTS ON GOALS OF 'SOYUZ T-10' FLIGHT
A. Pokrovskiy *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 5-7 Transl. into ENGLISH from Pravda (USSR),

9 Feb. 1984 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The tenth Soyuz T spacecraft mission is discussed. The core of research work is now truly being transferred more and more from the spacecraft to on board long-duration orbital stations. This is the main path of development in Soviet astronautics. A review of recent Soviet manned spaceflights is included. An overview of the technical objectives of the Soyuz T-10 flight is presented.
M.A.C.

N84-28826# Joint Publications Research Service, Arlington, Va.
MEDICAL RESEARCH PROGRAM OF 'SOYUZ T-10' CREW c52

In its USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 8-9 Transl. into ENGLISH from Med. Gaz. (USSR), 10 Feb. 1984 p 1 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The tasks to be performed by the physician aboard the Soyuz T-10 spacecraft were summarized. Among the subjects to be studied were: (1) the effect of weightlessness on the human body, (2) hemodynamics, (3) motion sickness, (4) blood electrolytes and mineral metabolism, (5) eye movements, (6) autonomic responses during optokinetic and vestibular stimulation, (7) blood supply to the eye, and (8) prophylactic training. R.S.F.

N84-28827# Joint Publications Research Service, Arlington, Va.
GOALS OF COSMONAUT AT'KOV'S MEDICAL STUDIES ON 'SALYUT-7' c52

A. Ivakhnov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 10-12 Transl. into ENGLISH from Izvestiya (USSR), 3 Mar. 1984 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The role of the physician on the Salyut-7 space station was summarized. The medical tasks included work on the following topics: (1) motion sickness, (2)weightlessness, (3) metabolism and the growth of blood cells, (4) the cardiovascular system, (5) blood composition, (6) bone metabolism, (7) hygiene, and (8) physical exercise. R.S.F.

N84-28828# Joint Publications Research Service, Arlington, Va.
SOYUZ T-10 DOCKS WITH 'SALYUT-7'

P. Gubarev *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 15-17 Transl. into ENGLISH from Pravda (USSR), 11 Feb. 1984 p 6 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The docking of Soyuz T-10 with the Salyut-7 space station was described from the cosmonauts viewpoint. Cosmonaut conversations were recorded. R.S.F.

N84-28829# Joint Publications Research Service, Arlington, Va.
CHANGES IN 'SOYUZ T-10' CREW WORK SCHEDULE

A. Ivakhnov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 18-20 Transl. into ENGLISH from Izvestiya (USSR), 17 Feb. 1984 p 6 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The intravehicular activity aboard the Salyut-7 space station following rendezvous with Soyuz T-10 was discussed briefly. The conversations of the cosmonauts were recorded. R.S.F.

N84-28830# Joint Publications Research Service, Arlington, Va.
COSMONAUTS BEGIN RESEARCH PROGRAM ON 'SALYUT-7'

V. Gubarev *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 21-22 Transl. into ENGLISH from Pravda (USSR), 19 Feb. 1984 p 6 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The research program conducted by cosmonauts aboard the Salyut-7 space station was discussed briefly. The specific activities and focus of the different cosmonauts were noted. R.S.F.

N84-28831# Joint Publications Research Service, Arlington, Va.
DOCKING OF 'PROGRESS-19', MAPPING AND SURVEY WORK c43

A. Ivakhnov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 23-25 Transl. into ENGLISH from Izvestiya (USSR), 25 Feb. 1984 p 4 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The docking of the Progress-19 cargo ship with the Salyut-7 - Soyuz T-10 complex was discussed in the context of cosmonaut/ground control communications. The payload of the cargo ship is described. A remote sensing project to inventory the natural Resources of the U.S.S.R. and develop land use maps for Mongolia was mentioned. R.S.F.

N84-28832# Joint Publications Research Service, Arlington, Va.
COMET STUDIES, MEDICAL RESEARCH ON 'SALYUT-7' c52

A. Pokrovskiy *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 26-27 Transl. into ENGLISH from Pravda (USSR), 27 Feb. 1984 p 8 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The Crommelin comet was photographed using a supersensitive French drive called Piramig. These photographs permit specialists more accurately to determine the levels of light intensity and other natural conditions during work with Halley's comet. Medical research was also carried out on this mission. B.G.

N84-28833# Joint Publications Research Service, Arlington, Va.
FEOKTISTOV: SPACE PROGRAM READY FOR MANUFACTURING SHOPS IN ORBIT

V. Gubarev *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 28-29 Transl. into ENGLISH from Pravda (USSR), 1 Jan. 1984 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Space manufacturing in low gravity environments was discussed. The effects of weightlessness on the cosmonauts were also described. Concern over U.S. militarization of space was voiced. B.G.

N84-28834# Joint Publications Research Service, Arlington, Va.
DEPUTY FLIGHT DIRECTOR BLAGOV ON 211-DAY FLIGHT OF BEREZOVOY AND LEBEDEV

V. C. Blagov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 30-42 Transl. into ENGLISH from Zemlya i Vselennaya (USSR), no. 5, Sep.-Oct. 1983 p 9-13 and no. 6, Nov.-Dec. 1983 p 18-22 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The longest flight (211 days) in the history of the cosmonauts was completed by A. N. Berezovoy and V. V. Lebedev. An overview and highlights of the mission were described. Postflight medical examinations of the cosmonauts were conducted. No irreversible effects to the health were noted. B.G.

N84-28835# Joint Publications Research Service, Arlington, Va.
FOOD SPECIALISTS DISCUSS COSMONAUT DIET c54

A. Maltsev and M. Frumkin *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 43-45 Transl. into ENGLISH from Pravda (USSR), 22 Sep. 1983 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

As the scope of space research expands the efforts in the field of food technology are growing and developing. The nutritional value of food products is studied in greater detail. Rations are created with a preventative purpose and a controlled selection of products depending on the various durations of the crew in space, as well as the volume and nature of the work to be accomplished. Author

N84-28836# Joint Publications Research Service, Arlington, Va.
FEOKTISTOV RECOUNTS PLANNING FOR GAGARIN SPACEFLIGHT

Konstantin Feoktistov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 46-48 Transl. into ENGLISH from Izvestiya (USSR), 9 Mar. 1984 p 2 (For primary document see N84-28823 19-12)

Avail: NTIS HC A07

The history of unmanned space flight leading up to manned space flight is discussed. The design and testing of spacecraft were examined. Criteria and design requirements were developed for manned space flight. B.G.

N84-28837# Joint Publications Research Service, Arlington, Va.
NIGHT LANDING OF 'SOYUZ-23' COSMONAUTS IN LAKE TENGIZ RECOUNTED
Gennadiy Bocharov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 49-56 Transl. into ENGLISH from Lit. Gaz. (USSR), 25 Jan. 1984 p 10 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Upon failure to dock with Salyut-7, the Soyuz-23 returned to earth. The difficulties encountered and the final recovery of the spacecraft are described. B.G.

N84-28838# Joint Publications Research Service, Arlington, Va.
RESEARCH ON 'PROGNOZ-9' AND 'ASTRON' SATELLITES c15
V. Gubarev *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 57-58 Transl. into ENGLISH from Pravda (USSR), 1 Jan. 1984 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Before cosmonautics, astronomy was separated from the stars and galaxies by the planet's air envelope like an insurmountable barrier. Concerning 1983 another powerful breakthrough was made beyond the boundaries of the atmosphere. A most complex astronomical instrument is located aboard the space observatories Astron and Prognoz-9, able to view much of what is taking place in the depths of the universe. Scientists at scientific centers in the country and aboard are following with interest the work of the largest optical telescope ever taken into space, of a powerful X-ray telescope and of record-sensitive equipment of Prognoz-9. The entire flow of information coming from the universe is concentrated in two of the country's academic scientific institutions--the Space Research Institute and the Crimean Astrophysical Observatory. Here the scientists work under whose direction the experimental equipment installed on Astron and Prognoz-9 was built. Author

N84-28839# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SPACE HOLOGRAPHY c35
V. Tuchkevich and S. Gurevich *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 59-62 Transl. into ENGLISH from Pravda (USSR), 1 Dec. 1983 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The capability to transmit information about transparent objects is a valuable asset of holography. A wide variety of the physicochemical properties of such objects can be investigated. The high resolution achievable in holography due to the absence of lens optics which distort an image, the high sensitivity to change in position or condition of an object being investigated, the possibility of superimposing several recordings on a single hologram and some other possibilities have major significance. Unfortunately, quite a few difficulties are encountered on the way to using the listed qualities of holography, and the number of difficulties becomes even greater when attempting to realize the advantages of holography in space. For the exploitation of holographic installations in space, suitable laser was selected and the size and mass of the installation reduced. The installation was made simpler in tuning and use, its reliability of operation increased, and such vibration resistance was made as to make the apparatus suitable for placement in orbit. Author

N84-28840# Joint Publications Research Service, Arlington, Va.
JOINT SOVIET-AMERICAN PROJECT FOR DETECTION OF GRAVITATIONAL WAVES c46
V. Dubinsky *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 63-64 Transl. into ENGLISH from Izvestiya (USSR), 21 Nov. 1983 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

A cooperative venture between the U.S.S.R. and the United States on the effects of gravitational waves is discussed. Twenty teams of scientists around the world are designing and building antennas to detect these waves. Two goals are sought: the demonstration of the existence of a qualitatively new structure of matter and a method for obtaining yet inaccessible information on the universe. B.G.

N84-28841# Joint Publications Research Service, Arlington, Va.
NUMERICAL-ANALYTICAL METHOD FOR COMPUTING MOVEMENT OF 12-HOUR ARTIFICIAL EARTH SATELLITES IN NEAR-CIRCULAR ORBITS Abstract Only c13
M. A. Vashkovyak *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 65 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 819-823 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

A description is given of an approximation numerical-analytical method for computing the movement of artificial earth satellites in near circular orbits with a period of revolution of about 12 hours. The method is based on the principles developed for predicting the movement of 24-hour satellites. The rapid method described is based on an analytical consideration of short-period perturbations of orbit components associated with the orbital movement of the satellite and the earth's rotation, and numeric integration of equations not involving fast variables. Perturbation effects resulting from the noncentral nature of the earth's gravitational field are discussed and the methods used to impart accuracy to the calculations are shown. Results obtained from calculations using the proposed numerical analytical method and from using numeric integration of strict movement equations are compared for a 50-day interval. Author

N84-28842# Joint Publications Research Service, Arlington, Va.
SPACE IN KEPLERIAN ORBITS Abstract Only c13
A. I. Averbukh *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 65-66 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 824-837 Original language document announced as A84-19727 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The three-parameter family of Keplerian orbits on a plane in the field of one attractive Newtonian center was mapped on a half-space of a three-dimensional Minkowski space. An analysis was made of the properties of geometrical objects in this space and of the families of orbits corresponding to them. Some applications of the results were discussed. B.J.

N84-28843# Joint Publications Research Service, Arlington, Va.
NUMERIC EXTENSION OF PERIODIC SOLUTIONS TO LAGRANGIAN SYSTEM WITH TWO DEGREES OF FREEDOM Abstract Only c64
A. G. Sokolskiy and S. A. Khovanskiy *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 66 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 851-860 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

A predictor-corrector method for numeric extension of periodic solutions for an autonomous Lagrangian system with two degrees of freedom was considered. Movement equations are given, and the predictor and corrector were examined. The stability of the constructed periodic movements was investigated, taking into account terms that are nonlinear relative to perturbations. To illustrate the use of the method, a two-dimensional canonical system describing the relative movement of a dynamically symmetric satellite in circular orbit was studied. A numeric solution was found as an extension of short-period Lyapunov movement from the vicinity of a hyperboloidal precession. Numerical solutions were calculated on a YeS-1045 computer using FORTRAN-4. Numerical results are shown in graphic form and indicate that the stability of the method is good at sufficiently low values for h. Author

N84-28844# Joint Publications Research Service, Arlington, Va.
FLIGHTS TO ASTEROIDS WITH SPACE VEHICLE MANEUVERS NEAR VENUS, EARTH, MARS AND JUPITER Abstract Only
L. B. Livanov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 67 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 861-867 Original language document announced as A84-19730 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Flight schemes from artificial earth satellites to large asteroids with almost circular orbits are proposed. The following flyby schemes were examined: Earth-Mars-asteroids; Earth-Venus-Earth-asteroids; and Earth-Mars-Earth-Jupiter-asteroids. The schemes were compared in terms of energy consumption and flight duration, and the most efficient schemes were indicated. B.J.

N84-28845# Joint Publications Research Service, Arlington, Va.
GUARANTEED ACCURACY IN DETERMINING ORBIT OF HALLEY'S COMET Abstract Only c91
A. A. Sukhanov and P. Y. Elyasberg *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 67 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 868-875 Original language document announced as A84-19731 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The maximum error in the orbital determination of Halley's comet, based on observations made during 1909 to 1911 and those planned for 1985 to 1987, was estimated. The estimate was obtained by allowing for observation errors and parameters of the comet motion model, assuming the possibility of an arbitrary correlation between the errors noted, and taking into account specified constraints on the correlation. Maximum orbit determination errors found in this way were minimized by the choice of an optimal estimation algorithm. An analysis was made of the dependence of the orbit determination errors on the makeup of the observations used and on the errors of the parameters of the Marsden model of the nongravitational acceleration of the comet. B.J.

N84-28846# Joint Publications Research Service, Arlington, Va.
DIFFUSE AURORAL ZONE. PART 7: DYNAMICS OF EQUATORIAL BOUNDARY IN FIELD OF DIFFUSE ELECTRON SPILL IN EVENING SECTOR Abstract Only c46
L. M. Nikolayenko, Y. I. Galperin, Y. I. Feldshteyn, Z. A. Sovo, and Z. Kranye *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 68 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 876-884 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The dynamics of the diffuse precipitation boundary in the evening sector as a function of the level of geomagnetic disturbance and of conditions in the interplanetary medium were studied using data from observations conducted aboard the Oreole-1 and Oreole-2 satellites. It was found that the diffuse precipitation boundary in the evening sector is closely associated with the level of geomagnetic disturbance, more so than with the parameters of the interplanetary medium. The reasons for this were discussed in the context of the geometry of force lines in the magnetosphere in the evening sector and the level of geomagnetic disturbance. A new geophysical effect was found, namely, an association between the position of the diffuse pecipitation boundary and the level of geomagnetic disturbance during the period covering several hours before intersection of the diffuse precipitation boundary. Good agreement was found between the results of these observations and observations made from other satellites (the ISIS2 and the DMSP/F2), indicating the representativeness of observations of the diffuse precipitation boundary in the evening sector. Author

N84-28847# Joint Publications Research Service, Arlington, Va.
FURTHER ANALYSIS OF PLASMA BURSTS IN HIGH-LATITUDE BOUNDARY LAYER OF EARTH Abstract Only c75
A. N. Omelchenko, O. L. Vaysberg, and K. T. Rassell *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 68-69 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 885-891 Original language document announced as A84-19733 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Prognoz 7 and 8 observations of dispersed plasma bursts beneath the magnetopause in the high latitude boundary layer of the earth were examined. These bursts were observed in the magnetotail in periods when a developed plasma mantle was absent. The plasma penetrates from a transition region to a region beneath the magnetopause as the result of the reconnection of force lines of the interplanetary magnetic field and tail lines of the earth dipole. B.J.

N84-28848# Joint Publications Research Service, Arlington, Va.
ION KINETICS, MINOR NEUTRAL AND EXCITED COMPONENTS IN D-REGION WITH HIGH LEVEL OF IONIZATION Abstract Only c75
V. A. Vlaskov, N. V. Smironova, and S. I. Kozlov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 69 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 892-896 Original language document announced as A84-19734 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The following components of the ion composition in the D region during periods of disturbed condition were analyzed with respect to their effect on variations in the D region: (1) the effective coefficient of recombination, (2) the relationship between concentrations of negative ions and electron concentration, (3) the relationship between the concentration of ion bonds and the concentration of simple positive ions, (4) the relationship between the concentration of complex negative ions and the concentration of simple ions, and (5) the relationship between the concentration of NO(+) ions and the concentration of O2(+) ions. The behavior of the components was studied on a seasonal and daily basis and on the basis of altitude and temperature. The model used for the calculations included 13 ion components and 15 neutral components. It was shown that the neutral components can exert a marked effect on changes in ion makeup and electron concentration in a disturbed ionosphere. Changes depend on temperature, time of day, season, and the intensity of the ionization source and its duration. At low intensities, the temperature of the neutral atmosphere is a major factor in observed changes. Increases in the ionization rate can result in changes in the oxygen components in the lower part of the D ration. Author

N84-28849# Joint Publications Research Service, Arlington, Va.
CUTOFF FOR SOLAR COSMIC RAYS IN EARTH'S MAGNETOSPHERE IN MAGNETICALLY QUIET PERIODS Abstract Only c92
A. S. Biryukov, T. A. Ivanova, L. M. Kovrygina, S. N. Kuznetsov, E. N. Sosovets, L. V. Tverskaya, and K. Kudela *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 70 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 987-906 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Results are presented from an observation of the cutoff for protons and electrons in solar cosmic rays during a period of increasing solar activity 22-25 November 1977 conducted simultaneously by the Cosmos-900 and the Intercosmos-17 satellites. Details are provided of satellite positions and instrumentation used during the observation. Proton and electron streams were recorded across an energy range of 1 MeV to greater than 100 MeV. It was shown that an association exists between the pressure of the solar wind on the magnetosphere and the position of the cutoff for protons at energies greater than 1 MeV. Electrons at energies greater than 30 MeV and protons at energies of 1, 4, 10 to 13, 30 and 100 MeV are cut off at lower latitudes than shown by calculation. The structure of the cutoff boundary was determined by splitting of the drift envelope and nonadiabatic effects as the particles move in an asymmetric geomagnetic field. Results were discussed in the context of earlier observations of solar cosmic ray cutoff. Author

N84-28850# Joint Publications Research Service, Arlington, Va.
ION MAKEUP IN UPPER ATMOSPHERE AFFECTED BY SOURCE OF X-RAY RADIATION Abstract Only **c46**
S. V. Avakyan *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 70 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 907-911 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The Auger effect was examined in the formation of multiple-charged ions of oxygen atoms and molecules and nitrogen molecules in the upper atmosphere at altitudes of 90 to 450 kilometers affected by pulsed bursts of X-ray radiation. The mechanisms of ionization under these conditions were analyzed. Calculations were made of the rate of formation and loss of O(2+), N2(2+) and O2(2+) ions. It was shown that large numbers of these ions relative to single charged particles are formed under the effect of X-ray radiation--from a few percent at altitudes of 200 to 250 kilometers, and several tens of percent at altitudes above 300 kilometers, with a lifetime of 1000 seconds. Author

N84-28851# Joint Publications Research Service, Arlington, Va.
QUASICIRCULAR EQUATORIAL ORBITS OF ARTIFICIAL EARTH SATELLITES WITH ALLOWANCE FOR LIGHT PRESSURE Abstract Only **c13**
Y. N. Polyakhova and Y. I. Timoshkova *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 71 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat., Mekh., Astron. (USSR), no. 1, Jan. 1984 p 100-106 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The analytical theory of motion of equatorial artificial earth satellites in quasicircular orbits was considered. In formulating the analytical theory, only gravitational perturbing effects were used in the computations (eccentricity of the earth's gravity field and gravitational lunar-solar perturbations). The theory is intended to predict the perturbed motion of an artificial earth satellite having a great sail effect and as a result experiencing the perturbing effect of light pressure. The screening effects of the Earth's shadow were not taken into account and the orbit was assumed to be completely illuminated by the Sun. The following topics are presented: (1) equations of motion of artificial satellites in linearized form, (2) photogravitational potential of the Sun in satellite problems, (3) solution of linearized system of equations, (4) determining arbitrary integration constants. The spherical coordinates of the satellite were determined with allowance for terrestrial, solar, and lunar gravitational perturbations and radiation pressure. The formulated theory is correct for short time intervals. Author

N84-28852# Joint Publications Research Service, Arlington, Va.
FORMULATION OF THEORY OF ARTIFICIAL EARTH SATELLITE MOTION BY HORI-DEPRIT METHOD Abstract Only **c13**
I. V. Tupikova *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 71-72 Transl. into ENGLISH from Pisma Astron. Zh. (USSR), v. 9, no. 12, Dec. 1983 p 750-754 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

A technique is proposed for eliminating both short and long period terms from the artificial earth satellite problem by use of a single canonical transformation. The proposed method for simultaneous exclusion of these terms can be used in combination with different variants of the averaging method. For example, if a semianalytical theory of motion of resonance satellites is formulated, the secular and resonance terms are retained in the Hamiltonian F(1) and the averaged system with this Hamiltonian is integrated numerically. The osculating elements are found from the mean elements using the formulas for replacement of variables derived in this article in which the generating function S characterizes aperiodic perturbations. The question of convergence of the presented algorithm remains open. Author

N84-28853# Joint Publications Research Service, Arlington, Va.
THREE-ELEMENT RADIOINTERFEROMETER WITH VERY LONG BASELINES Abstract Only **c35**
L. I. Matveyenko, R. Z. Sagdeyev, V. I. Kostenko, L. R. Kogan, Y. P. Molotov, S. P. Ignatov, A. B. Severnyy, I. G. Moiseyev, V. A. Yefanov, and R. L. Sorochenko *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 72 Transl. into ENGLISH from Pisma Astron. Zh.(USSR), v. 9, no. 7, Jul. 1983 p 415-420 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The technical features and operation are described for a very long baseline three element radiointerferometer based on the existing Simeiz-Pushchino radiointerferometer with the addition of a third Earth station located near Yevpatoriya. All antennas at the ground station complexes employ identical sets of equipment operating at a wavelength of 1.35 cm. At Simeiz and Pushchino, 22 meter antennas are used, while the one at Yevpatoriya has a diameter of 70 meters. Antenna characteristics and operation are discussed. The length of baselines is as follows: Yevpatoriya-Simeiz 108 km, Simeiz-Pushchino 1,150 km, Pushchino-Yevpatoroya 1,116 km. First observations with the radiointerferometer were conducted using H2O lines from Orion-K1, W51M, W49N and W30H to check out the system and calibrate amplitude and phase. The system makes possible studies of objects measuring 83 to 2.3 milliseconds of arc. Maximum sensitivity on the short leg (Yevpatoriya-Simeiz) is 20 mJy at 250 kHz and integration time of 100 secs. Author

N84-28854# Joint Publications Research Service, Arlington, Va.
LOCALIZATION OF X-RAY BRIGHT SPOTS RELATIVE TO CELLS IN SOLAR CHROMOSPHERIC GRID Abstract Only **c92**
S. A. Egamberdiyev *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 73 Transl. into ENGLISH from Pisma Astron. Zh. (USSR), v. 9, no. 12, Dec. 1983 p 745-749 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Some X ray pictures from the 'Atlas of X ray Pictures of the Solar Corona" (Zombeck et al, 1978) and from among those obtained aboard Skylab were compared with simultaneous filtered pictures of the K Ca+ and H alpha (0.5 Angstrom) lines. Pairs of pictures taken within the same time range of + or - 1.5 hours were selected. The positions of X ray bright spots were superimposed on transparencies of the contours of active fields and then enlarged to D(sun) = 200 mm and carefully correlated on the basis of as many details as possible. The location of X ray bright spots was determined relative to the chromospheric grid. Results are shown in tabular form. A total of 199 X ray bright spots was studied. The findings show that in the overwhelming majority of cases the X ray bright spots are located at the boundaries between grid cells, with ionization increasing with altitude through the solar atmosphere, indicating an association with fields of high vertical magnetic activity in the cell field. The fine structure of the X ray bright spots is discussed. Author

N84-28855# Joint Publications Research Service, Arlington, Va.
VENERA-15, -16 RADAR IMAGERY OF VENUS **c91**
O. N. Rzhiga *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 74-76 Transl. into ENGLISH from Zemlya Vselennaya (USSR), no. 1, Jan.-Feb. 1984 p 2-5 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The approach used to map the northern hemisphere of Venus using side-looking radar is described. As the Venera satellite passes through its pericenter a radar survey is made of a strip of the planet's surface about 100 kilometers wide and 7,000 kilometers long. The image is constructed with a phototelegraphic device whereby the whole strip is cut into pieces of about 1,000 kilometers in length. Two such fragments of a strip received during the first survey by Venera-15 and Venera-16 are presented and examined. A.R.H.

N84-28856# Joint Publications Research Service, Arlington, Va.
PROCESSING OF 'VENERA-15, -16' RADAR MAPPING IMAGERY **c91**
A. Pokrovskiy *In its* USSR Rept.: Space (JPRS-USP-84-003)

14 Jun. 1984 p 77-80 Transl. into ENGLISH from Pravda (USSR), 26 Feb. 1984 p 6 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Data collected by tape recorders on Venera-15 and -16 are transmitted to a magnetic tape at the Long Range Space Communications Center and then sent to the AN SSR Institute of Radio Engineering and Electronics. There a Fourier processor, whose productivity if 50-fold that of the BESM high speed computer, and peripheral equipment are used to process the radio signals into radar imagery. Each of the developed frames consist of two and a half thousand signals each. A.R.H.

N84-28857# Joint Publications Research Service, Arlington, Va.
ROUGHNESS OF SURFACE OF VENUS FROM BISTATIC RADAR DATA Abstract Only **c91**
O. Y. Milekhin, A. I. Kucheryavenkov, A. G. Pavelyv, and O. I. Yakovlev *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 81 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 921-928 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Results are presented from a determination of roughness on the surface of Venus in two regions at approximately 26.2 deg latitude 214.2 deg longitude and 26.3 deg latitude and 222.0 deg longitude using data from a bistatic radar installed on the Venera-10 probe. Practical difficulties in recording the data are discussed and the methodology for determining roughness values is shown. Analysis of experimental results shows that within the regions studied the roughness of the relief as characterized by the root-mean-square of the angle of slope (gamma) and a parameter characterizing the roughness of the dispersed surface (S) was slight. This is confirmed by the existence of a coherent component in the reflected radar signal. It is calculated from measurements of the strength of the coherent component that dispersion of random unevenness does not exceed 20-30 centimeters in height, with a horizontal spread of 30 to 300 meters. The results obtained indicate the effectiveness of using bistatic radar to study planetary reliefs. Author

N84-28858# Joint Publications Research Service, Arlington, Va.
UNBALANCED INFRARED RADIATION AND NATURAL LASER EFFECT IN ATMOSPHERES OF VENUS AND MARS Abstract Only **c71**
B. F. Gordiyets and V. Y. Panchenko *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 81-82 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 929-939 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The partical variable temperature and CO2 excitation in the 15 micrometer band and the infrared range below 4.3 micrometers in the atmospheres of Venus and Mars were studied theoretically. In addition an analysis was made of infrared radiation in the 10.6 and 9.4 micrometer bands for CO2 in the context of the features of infrared radiation capture. Studies were done for altitudes of 80 to 130 kilometers for Venus and 35 to 120 kilometers for Mars. The model and analytical method employed in the study were described. It was found that in the near-infrared (4.3 micrometers), there is direct conversion of absorbed radiation into planetary atmospheric radiation at 10.6 and 9.4 micrometers. A layer of unbalanced infrared radiation exists in these fields at an altitude of approximately 108 kilometers on Venus and about 60 kilometers on Mars at intensities of 2300 and 320 ERG/sq cm/sec respectively. Inversion settling occurs at 10.6 micrometers at the 00 deg 1 to 10 deg 0 boundary at altitudes of 110 to 125 kilometers for Venus and 70 to 80 kilometers for Mars. The findings indicate that Venus and Mars are the first known natural laser objects in the infrared range. Author

N84-28859# Joint Publications Research Service, Arlington, Va.
INTERPRETATION OF GRAVITATIONAL ANOMALIES ON MARS, VENUS AND EARTH Abstract Only **c91**
Y. A. Tarakanov, N. S. Kambarov, V. A. Prikhodko, and D. R. Bondarenko *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 82 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 12, Dec. 1983 p 3-15 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Findings based on gravimetric observations that relate to gravitational anomalies on Mars, Venus, and Earth are presented. Results for the three planets were compared. Interpretation of the results was based on Stokes constants using figures for field characteristics in a finite number of isolated points. Details of interpretation of gravitational anomalies are given for each of three plants. The main conclusions are: there is substantial difference in the structure and nature of compression on the three planets, the Earth's lithosphere is sufficiently thin and flexible to retain the shape of a hydrostatic balanced body, the probable source of gravitational anomalies on Venus is variation in the depth of the second-phase mantle boundary, and 11 of the 13 major anomalies detected on Mars result from irregularities in the lithosphere-mantle disjunction. Author

N84-28860# Joint Publications Research Service, Arlington, Va.
GENERALIZED MODEL OF LUNAR GRAVITATIONAL FIELD Abstract Only **c91**
K. G. Tadzhidinov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 83 Transl. into ENGLISH from Astron. Vestn. (USSR), v. 17, no. 4, Oct.-Dec. 1983 p 195-201 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Generalized models of the Moon's gravitational field were generated using the following data: the Doppler observations of the Apollo 15 and 16 and Lunar Orbiter 5, in the form of the 16th harmonic suggested by Ferrari; the model Ferrari constructed for the low-frequency part (down to $n = 5$) of selenopotential in the form of an expansion from the spherical functions, using data from laser and Doppler measurements made by Lunar Orbiter 4; the Akim and Vlasova model using data obtained from the Lunar series (10 to 24), in the form of a set of harmonic coefficients; the 83-point model of Brovar approximating the gravitational field of the equatorial part of the visible lunar surface, using data obtained by the Lunar Orbiter series (1 to 5) and Apollo 8 and Apollo 12; and a set of four profiles of beam accelerations above the central part of the visible lunar surface obtained during low passes by the command modules of the Apollo series (14 to 17). The latter profiles were not previously used in modeling the lunar gravitational field. Two methods were used to construct the models: determination of the harmonic coefficients by numeric integration of values for the radial product of the potential, and constructing a model by using a weighted least-squares method. Details are shown for each method and the 16th degree harmonics and relative values for a 225 point mass are shown in tabular form. The models were compared with earlier models. Author

N84-28861# Joint Publications Research Service, Arlington, Va.
OPTICAL STUDIES OF MOON ROCK SAMPLES AT VARIOUS DEGREES OF MATURITY Abstract Only **c91**
L. A. Akimov and Y. G. Shkuratov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 83-84 Transl. into ENGLISH from Astron. Vestn. (USSR), v. 17, no. 4, Oct.-Dec. 1983 p 201-209 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The effect of degree of maturity in lunar regolith on the optical effects of phase dependence of polarization and brightness and color at low phase angles was studied. Two pairs of samples obtained at the Lunar 16 and Lunar 24 landing sites were used in the study. Samples were similar in composition but differed in terms of maturity; details of physical properties are listed. Measurement of phase dependence for brightness and polarization was done in three intervals of the visible range (lambda 0.45, 0.50 and 0.65 micrometers). Scattered light was recorded using a low-angle receiver at various angles of incidence. Scattering angle was measured at 45 deg. Minimum phase angle was approximately 3 deg. Measurement of the scattering function was done at intervals of 3/4 deg. Results are shown in tabular and graphic form. The findings show that the opposition effect is greater in more mature

samples, particularly in red light. Phase dependence for sample color was also found to depend directly on the maturity of samples, with the color index increasing in step with increasing phase angle. Negative polarization increased slightly in nature samples. Results were compared with earlier studies and theoretical models were examined. Author

N84-28862# Joint Publications Research Service, Arlington, Va.
DISTRIBUTION OF CRATERS OF VARIOUS AGE ON MARTIAN SURFACE Abstract Only **c91**
Z. F. Rodionova and K. I. Dekhtyareva *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 84 Transl. into ENGLISH from Astron. Vestn. (USSR), v. 17, no. 4, Oct.-Dec. 1983 p 210-215 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Using published maps of the Martian surface a study was made of the four groups of craters according to age, using as a base albedo and hypsometric level. Of the 12,700 craters distinguished, 7% were assigned to the greatest age, 15% to ancient, 15% to new and 60% to very new. Craters were also categorized into four groups according to size. It was calculated that most craters assigned to the categories of greatest age, ancient and new lay within the 20-60-km range, while for the very new craters most were less than 20 km in diameter. Generally, the distribution of craters was found to be denser on dark areas and less dense on light areas, except for the Mare Acidalium which is dark but has a crater density of only 16 per 1 million square km. In studying crater distribution according to hypsometric level, a carbon dioxide pressure of 6.1 millibars was taken as a baseline; it was found that the highest crater density is at +3 to +4 kilometers and the lowest at -2 to 0 km. It is concluded that the ageing process takes place more rapidly in craters with diameters of 10-60 km in the lower fields remain for longer periods than craters in other categories, indicating two different ageing mechanisms. R.J.F.

N84-28863# Joint Publications Research Service, Arlington, Va.
FEASIBILITY OF FORMATION OF DISCRETE DUST BELTS AROUND EARTH Abstract Only **c46**
Y. K. Gulak *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 85 Transl. into ENGLISH from Astron. Vestn. (USSR), v. 17, no. 4, Oct.-Dec. 1983 p 232-237 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Patterns in the distribution of meteor dust around the Earth are studied on the basis of earlier theories on the existence of a dust field around the Earth and the debate about the permanence or transitional nature of both individual particles and particle conglomerates. A model is constructed that predicts material will be distributed according to the relationship between the length of the radial standing wave constant for a given system one of whose harmonics is an element of the linear commensurability of the radii of typical rings (a sub o) and the mass of the central body in the system (M). It is calculated that for Earth a sub o = 2,155.5 km, and on this basis a search model is constructed for the possible distribution of isoenergetic complexes and subcomplexes around the Earth. The theoretical calculations are compared with data obtained from the Geos-2 satellite during the period 7 February 1972 through 2 August 1974, and it is shown that the predicted a sub o = 2,155.5 km for Earth agrees well with the distribution of meteor particles recorded during this period. Author

N84-28864# Joint Publications Research Service, Arlington, Va.
EARTH'S DUST ENVELOP Abstract Only **c46**
V. L. Barsukov and T. N. Nazarova *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 85 Transl. into ENGLISH from Astron. Vestn. (USSR), v. 17, no. 4, Oct.-Dec. 1983 p 238-243 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The indeterminate results from attempts to clarify the mechanisms involved in the formation of dust belts around the Earth prompted a reworking of data obtained from the Elektron-1 aned Elektron-3 satellites. Data obtained from these satellites during the periods 31 January through 5 March 1964 (Elektron-1) and 11 July through 3 August 1964 (Elektron-3) were used in the study. Orbital parameters and recording methods are detailed. The findings indicate that meteor material in the Earth's dust envelope is unevenly distributed and also forms concentrations of particles that move in more or less stable orbits at definite distances from Earth. Dust rings around the Earth do not lie in a single plane but cover a broad band around the Earth. It is concluded that long-duration, systematic studies are required in order to obtain sufficient experimental data to clarify the fine structure of the Earth's dust belt and its shape. Author

N84-28865# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND MEDICINE: YESTERDAY AND TODAY **c51**
O. G. Gazenko *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 86-93 Transl. into ENGLISH from Zemlya Vselennaya (USSR), no. 5, Sep.-Oct. 1983 p 4-8 Original language document announced as A84-32369 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The progress of Soviet space biology and medicine is traced from the respective space flights of Laika, the space dog, in 1957, and Yuri Gagarin, the cosmonaut, aboard the Vostok in 1961 to the Kosmos series of biosatellites launched between 1973 and 1983. It is noted that centrifuge experiments aboard the Kosmos-936 demonstrated that the simulation of gravity in weightlessness prevents the development of many negative effects associated with weightless conditions. Important findings regarding the response of the human organism to intended space missions resulted from the Salyut-7 missions. Data on the functioning of the cardiovascular system and on red blood cell count are cited. R.J.F.

N84-28866# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF EQUIPMENT FOR 'COSMOS-1514' BIO-SATELLITE **c51**
T. Chesanova *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 94-97 Transl. into ENGLISH from Leningr. Pravda (USSR), 23 Dec. 1983 p 4 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The development of life support and bio-monitoring equipment on the Cosmos 1514 biosatellite is discussed. The equipment was used to support and monitor the monkey passengers. Problems in adapting monitoring equipment to the curious and destructive monkeys are emphasized. R.J.F.

N84-28867# Joint Publications Research Service, Arlington, Va.
RESULTS FROM STUDY OF EARTH RESOURCES FROM SPACE **c43**
L. Zlobin and Y. Kelner *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 98-100 Transl. into ENGLISH from Pravda (USSR), 12 Sep. 1983 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

A general discussion of the remote sensing of Earth Resources is given. The economic importance of remote sensing, resource management, satellite-borne photography, mapping, and photointerpretation are discussed. R.J.F.

N84-28868# Joint Publications Research Service, Arlington, Va.
INVESTIGATING SPATIAL DISTRIBUTION OF PHYTOPLANKTON IN LAKE BAYKAL BY OPTICAL METHODS Abstract Only **c51**
F. Y. Sidko, P. P. Sherstyankin, A. D. Aponasenko, L. A. Shur, N. A. Frank, and A. F. Sidko *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 101 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 11-14 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

It is argued that the total biomass and productivity of phytoplankton can be judged from the concentration of chlorophyll a.

distribution of phytoplankton chlorophyll in Lake Baykal was studied. It was found that water transparency in August 1976 was 4.5-9 m, with the chlorophyll content varying from 0.50 mg/cubic along the eastern shore in the northern part of the lake to 1.5 mg/meters along the western shore; in the open part of the lake the chlorophyll concentration was 0.5-1.0 mg/meters. Lower concentrations were observed in July 1977. The chlorophyll concentration maximum was usually at a depth two or three times greater than the transparency depth. The brightness of water body surfaces is dependent on the content and size distribution function of hydrosol particles. With a decrease in water transparency the reflection maximum is displaced into the long-wave region. In the spectra of the brightness coefficients there is registry of chlorophyll absorption, especially the red absorption band, from which it is possible to evaluate the content of phytoplankton chlorophyll in the surface layers of water bodies. R.J.F.

N84-28869# Joint Publications Research Service, Arlington, Va.
DEEP CRUSTAL STRUCTURE ON SPACE IMAGES Abstract Only c46
G. A. Tumanyan *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 102 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 32-39 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

A series of major landscape elements was defined in northern Armenia and adjacent areas from space photographs obtained by Soviet and American space vehicles. These landscape elements included: Neogene-Quaternary cover of mountains, plateaus and valleys, narror linearly elongated ranges, major outcrops of the Mesozoic-Cenozoic folded complex, penetrated by numerous lineaments and forming a complex mosaic-block pattern. Each of these landscape types is discussed in detail relative to their images on space photographs. It is shown that on space photographs the structures of the granite-metamorphic substrate, and also the structural stages of the folded complex, can be discriminated in the form of structural elements of second and higher orders. These structural elements of second and other orders in most cases are not discriminated on geological maps of different scales. But with an increase in the degree of their generalization their overall expression on space photographs forms lineaments which for the most part coincide with deep faults. These faults delimit major tectonic blocks of the buried structural stage, usually the crystalline basement. A whole series of distinctive formations and lineaments could be detected for the first time in the studied area due to the generalizing properties of space photographs. R.J.F.

N84-28870# Joint Publications Research Service, Arlington, Va.
SENSING OF FACTORS INVOLVED IN DEVELOPMENT OF EXOGENOUS PROCESSES ON SPACE PHOTOGRAPHS OF ARID TERRITORIES Abstract Only c43
A. I. Svitnev, M. I. Burleshin, and I. D. Kolesnikov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 103 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 40-48 Original language document announced as A84-14844 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The possibility of using space images of different levels of generalization for the indication of the geological-structural and climatic factors in the development of exogenic processes is examined. By way of example, attention is given to the study of the development of Karst, aeolian, and landslide processes on the basis of space images of a local level of generalization for arid platform regions. R.J.F.

N84-28871# Joint Publications Research Service, Arlington, Va.
STRUCTURAL-GEOMORPHOLOGICAL INTERPRETATION OF LINEAMENTS DETECTED FROM SPACE PHOTOGRAPHS AND PATTERNS OF MINERAL DISTRIBUTION Abstract Only c43
A. Y. Fedorov and Y. K. Yelistratova *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 103-104 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 49-59 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

Stereoscopic interpretation of space photographs, from the Meteor satellites at scales of 1:10,000,000 and 1:2,500,000 for the Ural region were used in defining first order lineaments grouped into a hexagonal lattice, illustrated in a map of interpreted features. The parameters of the lattice were examined for latitudes 52-58 degrees N; the average distance between the points of intersection of lineaments was 274 km; the average distance between lineaments was 235 km. The mapped lattice was subjected to geological-geomorphological and geophysical analysis for ascertaining its reality and investigating its properties. The specific results of this analysis are presented in detail, taking into account the different plotted features (first order faults of the meridional lattice; second and third order faults of this same lattice; faults in latitudinal hexagonal lattice; main and secondary water-divides, elevations, large and small intrusions and dikes, etc.). The position and strike of these lineaments are examined in relation to the magnetic and gravitational fields. It as confirmed that the lineaments are basement faults forming the present-day relief; the defined hexagonal lattice was found to be real and the first order faults, of considerable extent and width, in essence are zones of increased crustal permeability. R.J.F.

N84-28872# Joint Publications Research Service, Arlington, Va.
SEASONAL VARIATION OF SPECTRAL BRIGHTNESS COEFFICIENTS FOR BARLEY AND RYE Abstract Only c43
T. A. Nilson, Y. A. Anton, and V. B. Apley *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 104-105 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 72-80 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The results of ground measurements of the seasonal variation of the spectral brightness coefficient (SBC) of barley and rye fields are given together with an analysis which takes into account the phenological development of plants. The field measurements are made in four seasons in barley and rye fields in experimental plots at a seed selection station. The principal instrument used was a field four channel photometer. After photometric measurements are made in the control areas the crop phenophase is determined using the methods usually employed in agrometeorology. The moistness of the soil surface is also determined visually on a four-unit scale. The spectral brightness coefficient and vegetation index of these two crops during different phenophases. The seasonal variation of the SBC and vegetation index or other such combined spectral characteristics correlate fairly well with the phenophases of development of grain crops. M.A.C.

N84-28873# Joint Publications Research Service, Arlington, Va.
ORGANIZING WORK WITH INFORMATION FLOWS IN SYSTEM FOR AUTOMATED PROCESSING OF DATA FROM REMOTE SENSING OF THE EARTH FOR USE IN AGRICULTURE Abstract Only c43
Y. S. Kolesnikov, G. S. Popov, and Y. V. Skorobogatov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 105-106 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 85-92 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

A system for the remote sensing of the state of agricultural resources is discussed, which includes automated data processing requiring the use of several computers. The complex includes a specialized data bank, one computer being specially allocated for this purpose. This computer has peripherals making possible the input of information supplied in different forms; the display and registry of initial, intermediate and final information on color half tone displays, on alphabetical/digital displays and with printout devices and an automatic color curve plotter. The capacity for storage is on magnetic direct access carriers. Examples of the type of information which can be furnished by the system are given. The programming support is organized on the modular principle and the system can be readily augmented by the addition of other modules. While intended for the handling of agricultural data, the same system can be employed for systems

for remote sensing of natural resources, such as forests and minerals. M.A.C.

N84-28874# Joint Publications Research Service, Arlington, Va.
AUTOMATED SEARCH FOR CONTROL IMAGES ON PHOTOGRAPHS OF EARTH'S SURFACE USING SPECTRAL ANALYSIS Abstract Only **c43**
D. K. Tkhabisimov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 106 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 93-99 Original language document announced as A84-14848 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The fast Fourier-Bessel transformation was used for the machine search for control images on space photographs of the Earth's surface. Shifts and turns on a plane were taken as the admissible transformations of the control images; the coherence function of fragments of the photograph is invariant with respect to these admissible transformations. The Laplace operator is used to increase the relative energy of the control images. The image processing was carried out on the SITRIM-80 special-purpose complex. Author (IAA)

N84-28875# Joint Publications Research Service, Arlington, Va.
METHOD FOR CREATING SYNTHESIZED IMAGES USING DIAZO COLOR FILMS Abstract Only **c35**
R. Kaczinski *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 107 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 100-102 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The diazo film method involves the preparation of color synthesized images by the ultraviolet exposure of the diazo film without the use of additive projectors. Its relative simplicity makes possible the production of synthesized images at all centers making use of multizonal aerial and space photographs and an arbitrary combination of images obtained in different spectral channels for the purpose of obtaining the desired synthesized images. Diazo material makes it possible to obtain copies with a greater contrast than on the original materials. The successive steps in the processing of diazo materials are discussed. As a result of forming of different combinations it is possible to obtain from several tens to more than a hundred different variants of sets for interpretation. M.A.C.

N84-28876# Joint Publications Research Service, Arlington, Va.
CRITERIA FOR EFFICIENCY OF EXPERIMENTS IN REMOTE SENSING Abstract Only **c43**
A. A. Yakovlev *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 107-108 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 103-112 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The problems involved in solution of inverse problems in remote sensing and analysis of their information content are discussed. One of the most important tasks is optimization of remote measurements with selection of the best criteria for optimality of an experiment. Several possible approaches to determination of such criteria are examined. A Formulation of the problem is given and the problem of search for the best measurement plan is examined. Criteria for evaluating the quality of an experiment on the basis of the qualitative and quantitative makeup of the information obtained in an experiment are investigated. A numerical algorithm for optimization of a remote sensing experiment can be based solely on computation of the characteristics of the matrix of information of measurements S(f). The tests, characterizing the value of a solution, is recommended as the principal criterion of the effectiveness of an experiment for problems in remote sensing of the environment. The applicability of this test is illustrated in a specific example. M.A.C.

N84-28877# Joint Publications Research Service, Arlington, Va.
IZVESTIYA ASSAILS U.S. MILITARY SPACE PLANS
L. Koryavin *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 109-111 Transl. into ENGLISH from Izvestiya (USSR), 5 Oct. 1983 p 5 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The MILSTAR program is discussed. This is the name of a constellation of U.S. military satellites, which will be placed in orbit in order to provide the president with the basic means for controlling nuclear and conventional forces. The significance of satellites for military command is common knowledge. The U.S. Army already uses them extensively for communication. The question of militarizing outer space is debated actively in U.S. military and political circles along with other military programs. M.A.C.

N84-28878# Joint Publications Research Service, Arlington, Va.
U. S. ASAT PROGRAM VIEWED AS ELEMENT OF SPACE MILITARIZATION POLICY
S. Oznobishchev *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 112-115 Transl. into ENGLISH from Krasnaya Zvezda (USSR), 28 Feb. 1984 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The antisatellite policies and technology of the United States are discussed in relation to the Soviet Union. M.A.C.

N84-28879# Joint Publications Research Service, Arlington, Va.
FURTHER COMMENTARY ON U. S. ASAT PROGRAM
A. Mozgovoy *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 116-118 Transl. into ENGLISH from Sov. Rossiya (USSR), 2 Mar. 1984 p 5 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

The antisatellite policies, capabilities, and technology of the United States are discussed by a prepresentative of the Soviet Union. The history of antisatellite weapon systems development is also examined. M.A.C.

N84-28880# Joint Publications Research Service, Arlington, Va.
LIST OF RECENT SOVIET SPACE LAUNCHES
In its USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 119-120 Transl. into ENGLISH from Tass (USSR), n.d. (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

A schedule of recent space launches of Soviet spacecraft is presented. Information includes launch date flight designation, orbital parameters, and the objective of each mission. M.A.C.

N84-28881*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FLIGHT DATA FILE: STS-4 CREW ACTIVITY PLAN Final Report
Elvin B. Pippert, Jr. 14 May 1982 335 p refs
(NASA-TM-85502; JSC-17878; NAS 1.15:85502) Avail: NTIS HC A15/MF A01 CSCL 22A

The STS-4 Crew Activity Plan contains the on-orbit timeline, which is a flight data file article. Various time scales such as Mission Elapsed Time (MET), Greenwich Mean Time (GMT), and time until deorbit ignition as well as crew activities, day/night, orbit position, ground tracking, communication coverage, attitude, and maneuvers are presented in chart form. M.A.C.

N84-28882*# RCA Government Systems Div., Princeton, N.J. Astro-Electronics.
EXCESS SCIENCE ACCOMMODATION CAPABILITIES AND EXCESS PERFORMANCE CAPABILITIES ASSESSMENT FOR MARS GEOSCIENCE AND CLIMATOLOGY ORBITER: EXTENDED STUDY Final Report
K. Clark, A. Flacco, P. Kaskiewicz, and K. Lebsock 27 May 1983 102 p Prepared for JPL, Pasadena, Calif.
(Contracts NAS7-918; JPL-956291)
(NASA-CR-173765; NAS 1.26:173765) Avail: NTIS HC A06/MF A01 CSCL 22A

The excess science accommodation and excess performance capabilities of a candidate spacecraft bus for the Mars Geoscience and Climatology Orbiter MGCO mission are assessed. The appendices are included to support the conclusions obtained during this contract extension. The appendices address the mission analysis, the attitude determination and control, the propulsion subsystem, and the spacecraft configuration. M.A.C.

N84-28883*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REPAIRING SOLAR MAX: THE SOLAR MAXIMUM REPAIR MISSION
Tracy McMahan and Valerie Neal [1984] 17 p Original contains color illustrations
(NASA-EP-205; NAS 1.19:205) Avail: NTIS HC A02/MF A01; SOD HC $1.50 CSCL 22A

Technology and procedures designed for replacing a faulty attitude control module and scientific instruments on the only orbiting solar observatory are described. The rationale for the repair mission is given and the operations of the flight support system within the cargo bay of the space shuttle are discussed. The use of the manned maneuvering unit in capturing the satellite and of the remote manipulator arm in berthing it are discussed, as well as the space tools to be used for repair operations. The space crew and their responsibilities are identified. A.R.H.

N84-28884*# Operations Research, Inc., Silver Spring, Md.
WARC AND CCIR SUPPORT FOR SPECTRUM-ORBIT PLANNING Final Report
Peter H. Sawitz 30 May 1980 110 p
(Contract NASw-3309)
(NASA-CR-163048; NAS 1.26:163048; ORI-TR-1742) Avail: NTIS HC A06/MF A01 CSCL 22A

Papers prepared for the use of the U.S. delegation to the 1979 World Administrative Radio Conference; papers contributed to the National CCIR study groups on broadcasting satellites and spectrum-orbit utilization; responses to specific requests for technical analyses and evaluations; and papers presented at technical conferences on related topics are presented. Nonlinear optimization methods for finding optimum positions of satellites in the fixed satellite service; the effects of geography on the use of the geostationary orbit; intercontinental orbit sharing; traffic coordination in interfering satellites operating in the fixed satellite service; and domestic fixed and broadcasting satellite systems are covered. A possible channel orbit plan for broadcasting satellite service in the U.S. and Canada; polarization for broadcasting satellite systems; and the communication capacity of the geostationary satellite orbit are also examined. A.R.H.

N84-28885# European Space Agency, Paris (France).
REPORT PRESENTED BY THE EUROPEAN SPACE AGENCY TO THE 25TH COSPAR MEETING
W. R. Burke, ed. May 1984 309 p refs Meeting held at Graz, Jun. 1984 Original contains color illustrations
(ESA-SP-1061) Avail: NTIS HC A14/MF A01

European Space Agency satellites and payloads launched, and projects under development are discussed. The Cos-B, Geos, ISEE, IUE, EXOSAT and First Spacelab Payload programs are described. The ISPM, Space Telescope, Hipparcos, Giotto, ISO, and Eureca, projects are outlined. The Solar and Heliospheric Observation, Cluster X-80 X-ray astronomy, X-ray Multi Mirror Astronomy Mission, Asteroid Gravity Optical and Radar Analysis mission, Columbus UV astronomy mission Quasat orbiting radio telescope, Far IR and Submillimetre Space Telescope, and Saturn Orbiter Titan Probe projects are summarized. Author (ESA)

N84-29831*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MISSION AND TRAJECTORY DESIGN FOR THE VENUS ORBITING IMAGING RADAR
Johnny H. Kwok *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 245-252 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N84-28841# Joint Publications Research Service, Arlington, Va.
NUMERICAL-ANALYTICAL METHOD FOR COMPUTING MOVEMENT OF 12-HOUR ARTIFICIAL EARTH SATELLITES IN NEAR-CIRCULAR ORBITS Abstract Only
M. A. Vashkovyak *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 65 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 819-823 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28842# Joint Publications Research Service, Arlington, Va.
SPACE IN KEPLERIAN ORBITS Abstract Only
A. I. Averbukh *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 65-66 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 824-837 Original language document announced as A84-19727 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28851# Joint Publications Research Service, Arlington, Va.
QUASICIRCULAR EQUATORIAL ORBITS OF ARTIFICIAL EARTH SATELLITES WITH ALLOWANCE FOR LIGHT PRESSURE Abstract Only
Y. N. Polyakhova and Y. I. Timoshkova *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 71 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat., Mekh., Astron. (USSR), no. 1, Jan. 1984 p 100-106 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28852# Joint Publications Research Service, Arlington, Va.
FORMULATION OF THEORY OF ARTIFICIAL EARTH SATELLITE MOTION BY HORI-DEPRIT METHOD Abstract Only
I. V. Tupikova *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 71-72 Transl. into ENGLISH from Pisma Astron. Zh. (USSR), v. 9, no. 12, Dec. 1983 p 750-754 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-29817# Comision Nacional de Investigaciones Espaciales, San Miguel (Argentina). Centro Espacial.
A METHOD FOR THE ESTIMATION OF SMALL PERTURBATIONS
Pedro E. Zadunaisky *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 91-102 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29821# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AN ADAPTIVE SATELLITE ORBIT ESTIMATION SCHEME USING AN ANALYTICAL APPROACH AND A DYNAMICAL MODEL COMPENSATION TECHNIQUE
A. Rios Neto and R. Negreiros dePaiva *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 133-146 ref Previously announced as N82-18270 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29824# Instituto Tecnologico de Aeronautica, Sao Jose dos Campos (Brazil). Dept. de Astronomia.
COMMENT ON COUPLED PERTURBATIONS ON ORBITS OF ARTIFICIAL EARTH SATELLITES
R. Vilhena deMoraes and M. T. R. Fitzgibbon *In* Sao Paulo Univ.

The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 175-182 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29839# Paris VI Univ. (France).
PERIODIC ORBITS AND LIBRATION IN THE MIMAS-TETHYS CASE Abstract Only
I. Stellmacher *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 301-302 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N84-28886# Range Commanders Council, White Sands Missile Range, N. Mex. Documentation Group.
UNIVERSAL DOCUMENTATION SYSTEM HANDBOOK. SUPPLEMENT 2: PROCEDURES FOR THE ELECTRONIC PROCESSING OF LEVEL 1, 2 AND 3 TEST REQUIREMENTS AND SUPPORT INFORMATION
May 1984 54 p Supersedes DG-501-79-SUPPL-2, AD-A108901 (AD-A141850; DG-501-84-SUPPL-2; DG-501-79-SUPPL-2) Avail: NTIS HC A04/MF A01 CSCL 09/2

This supplement describes the procedures for converting the Universal Documentation System (UDS) horizontal forms to a vertical format more conducive to electronic transmission. This system may be used in conjunction with UDS documents using standard UDS forms or in place of the standard format when automation or electronic processing of UDS documents is desired. The Universal Documentation System Handbook, Document 501-79, Volumes 1, 2, and 3, dated 11-79, (AD-108901) should be used for detailed instructions. These procedures do not address the electronic transmission of classified information. GRA

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N84-28887*# Goodyear Aerospace Corp., Akron, Ohio.
SYSTEM DEFINITION STUDY OF DEPLOYABLE, NONMETALLIC SPACE STRUCTURES
Frederick J. Stimler Jun. 1984 156 p refs
(Contract NAS8-35498)
(NASA-CR-171090; NAS 1.26:171090; GAC-19-1615) Avail: NTIS HC A08/MF A01 CSCL 22B

The state of the art for nonmetallic materials and fabrication techniques suitable for future space structures are summarized. Typical subsystems and systems of interest to the space community that are reviewed include: (1) inflatable/rigidized space hanger; (2) flexible/storable acoustic barrier; (3) deployable fabric bulkhead in a space habitat; (4) extendible tunnel for soft docking; (5) deployable space recovery/re-entry systems for personnel or materials; (6) a manned habitat for a space station; (7) storage enclosures external to the space station habitat; (8) attachable work stations; and (9) safe haven structures. Performance parameters examined include micrometeoroid protection; leakage rate prediction and control; rigidization of flexible structures in the space environment; flammability and offgassing; lifetime for nonmetallic materials; crack propagation prevention; and the effects of atomic oxygen and space debris. An expandable airlock for shuttle flight experiments and potential tethered experiments from shuttle are discussed. A.R.H.

N84-28888# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ON DYNAMICAL FORMULATION OF A TETHERED SATELLITE SYSTEM WITH MASS TRANSPORT
F. C. Liu 25 May 1984 55 p
(AD-A142312; AU-AFIT-EN-TR-84-1) Avail: NTIS HC A04/MF A01 CSCL 12/1

Two satellites connected by a long flexible tether along the earth radial direction comprise a stable equilibrium state. This research investigates the manner in which a third mass transporting from one satellite to the other disturbs the equilibrium state. A system of four equations of in-plane motion has been derived based on the assumptions that the tether remains straight between the masses and of constant length. A combination of computer subroutines DGEAR and ZANAYT is suggested for the approximate solution of the system of nonlinear differential equations with one constraint condition on the variables. Alternatively, a system of four independent differential equations are derived by eliminating the Lagrange multiplier. Author (GRA)

N84-28889# European Space Agency, Paris (France).
MONITORING OF SHIP ROUTES VIA SATELLITE
Rudolf Schmid Mar. 1984 18 p refs Transl. into English of "Schiffsroutenfernueberwachung ueber Satelliten" rept. DFVLR-Mitt-83-15 DFVLR, Oberpfaffenhofen, West Germany, 1983 Original language document was announced as N84-16240 (ESA-TT-842; DFVLR-Mitt-83-15) Avail: NTIS HC A02/MF A01; original German version available from DFVLR, Cologne DM 9,50

On the basis of experience gained during the German Experimental Ship Station project, the route taken by a ship was remotely monitored with the aid of a ship-shore satellite data link (TRANSIT/MARISAT). Analysis of the data resulted in a graphic plot of the ship's route. Standard commercial hardware was used. Author (ESA)

N84-28838# Joint Publications Research Service, Arlington, Va.
RESEARCH ON 'PROGNOZ-9' AND 'ASTRON' SATELLITES
V. Gubarev *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 57-58 Transl. into ENGLISH from Pravda (USSR), 1 Jan. 1984 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-29818# Universidade Federal de Parana, Curitiba (Brazil). Dept. de Fisica.
DRAG ON GEODYNAMIC SATELLITES
G. B. Afonso and Liu Kai *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 105-116 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29819# Naval Research Lab., Washington, D. C.
SATELLITE ORBIT THEORIES BASED ON THE ELIMINATION OF THE PARALLAX
S. L. Coffey and K. T. Alfriend *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 117-126 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29820# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
INCLINED GEOSYNCHRONOUS SATELLITES
Paul E. Nacozy *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 127-131 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29822# Computer Technology Associates, Inc., Englewood, Colo.
THE NEST GENERATION IN SATELLITE FLIGHT CONTROL SYSTEMS
C. E. Velez *In* Sao Paulo Univ. The Motion of Planets and Nat.

and Artificial Satellites, Volume 2 1983 p 147-164 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29823# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A RAPID ESTIMATION OF NEAR EARTH SATELLITE LIFETIMES WITH QUASI-DYNAMIC ATMOSPHERIC MODEL WITH APPLICATION TO A PROPOSED BRAZILIAN SATELLITE
Nellore S. Venkataraman and Kondapalli Rama Rao (Inst. de Planejamento e Estudos Ambientais) *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 165-174 refs Previously announced as N82-18272 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29838# Communications Satellite Corp., Washington, D.C. Astrodynamics Dept.
COLOCATION STATIONKEEPING OF GEOSTATIONARY SATELLITES Abstract Only
Victor J. Slabinski *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 300 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N84-28890# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
WIND TUNNEL MATERIAL TEST TO QUANTIFY SPACE SHUTTLE EXTERNAL TANK INSULATION REQUIREMENTS Final Report, 26 - 28 Jul. 1983
A. S. Hartman AEDC Sep. 1983 37 p Sponsored by AEDC
(AD-A141563) Avail: NTIS HC A03/MF A01 CSCL 13/1

The objective of this test was to determine the response of the thermal protection material used in the press line bracket/cable tray region of the Space Shuttle External Tank (ET) to an aerothermal environment. Foam insulation specimens were mounted on a concave plate which was injected to the edge of the wind tunnel nozzle. This allowed the nozzle boundary layer to flow onto the specimen plate. Thus, the turbulent boundary layer approaching the specimen region was significantly thicker than could be produced by other more standard test methods. Data from this test will be used to evaluate a possible reduction in weight of the Space Shuttle External Tank by reducing the amount of insulative material or replacing it with a lighter material. GRA

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-28891*# Boeing Aerospace Co., Seattle, Wash.
SPACE STATION SYSTEMS TECHNOLOGY STUDY. VOLUME 2: TRADE STUDY AND TECHNICAL SELECTION TECHNICAL REPORT Final Report
Feb. 1984 191 p refs
(Contract NAS8-34893)
(NASA-CR-173776; NAS 1.26:173776; D180-27935-2-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 22B

High leverage technologies are examined for application to the space station. The areas under investigation include attitude control, data management, long life thermal management, and automated housekeeping integration. M.A.C.

N84-28892*# Howard Univ., Washington, D. C. Dept. of Mechanical Engineering.
THE DYNAMICS AND CONTROL OF LARGE FLEXIBLE SPACE STRUCTURES, PART 7 Final Report
Peter Bainum, A. S. S. R. Reddy, R. Krishna, Cheick M. Diarra, and S. Ananthakrishnan Jun. 1984 113 p refs
(Grant NsG-1414)
(NASA-CR-173781; NAS 1.26:173781) Avail: NTIS HC A06/MF A01 CSCL 22B

A preliminary Eulerian formulation of the in-plane dynamics of the proposed spacecraft control laboratory experiment configuration is undertaken when the mast is treated as a cantilever type beam and the reflector as a lumped mass at the end of the beam. Frequency and mode shapes are obtained for the open loop model of the beam system and the stability of closed loop control systems is analyzed by both frequency and time domain techniques. Environmental disturbances due to solar radiation pressure are incorporated into models of controlled large flexible orbiting platforms. Thermally induced deformations of simple beam and platform type structures are modelled and expressions developed for the disturbance torques resulting from the interaction of solar radiation pressure. Noise effects in the deterministic model of the hoop/column antenna system are found to cause a degradation in system performance. Appropriate changes in the ratio of plant noise to the measurement noise and/or changes in the control weighting matrix elements can improve transient and steady state performance. A.R.H.

N84-28893*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INTERACTIVE SYSTEMS DESIGN AND SYNTHESIS OF FUTURE SPACECRAFT CONCEPTS
Robert L. Wright, Darienne D. DeRyder, and Melvin J. Ferebee, Jr. Jun. 1984 39 p refs Presented at the AIAA Profess. Study Seminar, Newport Beach, Calif., 4 Jun. 1984
(NASA-TM-86254; NAS 1.15:86254) Avail: NTIS HC A03/MF A01 CSCL 22B

An interactive systems design and synthesis is performed on future spacecraft concepts using the Interactive Design and Evaluation of Advanced spacecraft (IDEAS) computer-aided design and analysis system. The capabilities and advantages of the systems-oriented interactive computer-aided design and analysis system are described. The synthesis of both large antenna and space station concepts, and space station evolutionary growth is demonstrated. The IDEAS program provides the user with both an interactive graphics and an interactive computing capability which consists of over 40 multidisciplinary synthesis and analysis modules. Thus, the user can create, analyze and conduct parametric studies and modify Earth-orbiting spacecraft designs

(space stations, large antennas or platforms, and technologically advanced spacecraft) at an interactive terminal with relative ease. The IDEAS approach is useful during the conceptual design phase of advanced space missions when a multiplicity of parameters and concepts must be analyzed and evaluated in a cost-effective and timely manner. Author

N84-28894*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONCEPTUAL DESIGN OF A MOBILE REMOTE MANIPULATOR SYSTEM
Harold G. Bush, Martin M. Mikulas, Jr., Richard E. Wallsom (Kentron International, Inc., Hampton, Va.), and J. Kermit Jensen Jul. 1984 16 p refs
Avail: NTIS HC A02/MF A01 CSCL 22B

A mobile remote manipulator system has been identified as a necessary device for space station. A conceptual design for an MRMS is presented which features (1) tracks on the MRMS and guide pins only on the truss structure, (2) a push/pull drive mechanism which rotates to permit movement in four directions, and (3) spacecrane and mobile foot restraint manipulators (or arms). Operational and design features of the MRMS elements are described and illustrated. Concepts are also presented which permit rotating the operational plane of the MRMS through 90 deg. Such a system has been found to have great utility for initial space station construction, maintenance and repair, and to provide a construction capability for future station growth or large spacecraft assembly and/or servicing. Author

N84-28895# Missouri Univ., Rolla. Dept. of Mechanical and Aerospace Engineering.
WEIGHT CHARACTERISTICS OF FUTURE SPACECRAFT THERMAL MANAGEMENT SYSTEMS Final Report, 1 Jan. - 30 Oct. 1983
J. W. Sheffield Wright-Patterson AFB, Ohio AFWAL Feb. 1984 39 p
(Contract F33615-81-C-2058; AF Proj. 3145)
(AD-A141403; AFWAL-TR-84-2005) Avail: NTIS HC A03/MF A01 CSCL 22/2

This report presents the results of an investigation on the weight characteristics of future spacecraft thermal management systems. The sensitivity of the thermal management system weight to the performance requirements of both evolutionary and revolutionary spacecraft missions has been studied. A numerical analysis modelling the transient heat flow through the thermal management system was performed. The performance parameters included the peak thermal load and the peak-to-average thermal load ratio. In addition the sensitivity of the thermal management system weight to the choice of phase change material for heat storage was determined via a heat of fusion parametric analysis. Author (GRA)

N84-28896# California Univ., Berkeley. Electronics Research Lab.
AN INTEGRATED, OPTIMIZATION-BASED APPROACH TO THE DESIGN AND CONTROL OF LARGE SPACE STRUCTURES Annual Scientific Report, 1 Oct. 1983 - 1 May 1984
E. Polak, K. S. Pister, and R. L. Taylor 1 May 1984 21 p
(Grant AF-AFOSR-0361-83; AF Proj. 2304)
(AD-A141856; AFOSR-84-0448TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The investigators proposed to consider the design of large space structures which are required to perform large amplitude maneuvers at the end of which they are required to remain locked on a target. They proposed to deal with the pointing of the LSS in two stages. In the first stage, the control task is to rapidly redirect the pointing direction of the LSS reference axis, e.g., the line-of-sight of a telescope or antenna, by open loop optimal control, the large motions of the LSS induced by the maneuver must quiet down so that the control of the LSS can be transferred to a linear, closed loop control system. The task of the latter is to damp out the induced structural vibrations, and, finally, to lock the pointing direction on the target. For the purpose of obtaining a tractable model problem for the research, the investigators shall initially assume that the LSS is a beam. The investigators shall use a nonlinear beam model for the large motions, and they shall use a linear beam model to describe the small displacements as a perturbation around the equilibrium rigid body configuration. In fully developing the model problem, described within the investigators shall first develop the equations of motion for a beam under large and small displacement conditions. They shall then use the resulting equations in transcribing sample design specifications into infinite systems of inequalities. Author (GRA)

N84-28897# Department of the Air Force, Washington, D.C.
LOW TEMPERATURE RATE CONTROLLER Patent Application
A. Holmberg, inventor (to Air Force) Filed 8 Dec. 1983 9 p
(AD-D011029; US-Patent-Appl-SN-559612) Avail: NTIS HC A02/MF A01 CSCL 22/2

A rate controller for use in outer space is provided where motion damping occurs by forcing damping fluid from one side of an actuator piston to the other side of the piston through an external line. The damping fluid is totally contained in a sealed system of metallic bellows with no seals required between moving parts and the external environment. Author (GRA)

N84-29344*# National Aeronautics and Space Administration, Washington, D. C.
SPACE STATION
A. F. Forestieri *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 237-250 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 22B

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N84-28898# MATRA Espace, Paris-Velizy (France).
ASSESSMENT OF DATA HANDLING CONFIGURATION FOR ON-BOARD OPERATION SYSTEM DEFINITION Final Report
A. Dherbecourt, M. Cellier, L. Riou, and J. Sotta Paris ESA 1983 368 p
(Contract ESTEC-4710/81/NL-PP)
(DM55/JPS/JP/321.82; ESA-CR(P)-1866) Avail: NTIS HC A16/MF A01

Trends in spacecraft onboard data handling (and processing) (OBDH (and P)) systems are assessed. The adequacy of OBDH system configurations for new missions is considered. Standardization of the DHP systems in a reduced number of classes is proposed. Required extensions of OBDH definitions and performances are identified. Implementation solutions for DHP classes are proposed. Simple DHP systems, as used for GEO telecom missions or small scientific satellites; multipurpose systems, which can support all planned sophisticated satellite missions (except manned flight); and DHP systems for docking, and adaptation of the two previous classes, are covered. Author (ESA)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-28899*# KMS Fusion, Inc., Ann Arbor, Mich.
SINGLET OXYGEN GENERATOR FOR A SOLAR POWERED CHEMICALLY PUMPED IODINE LASER Final Report

George E. Busch Apr. 1984 17 p
(Contract NAS1-17584)
(NASA-CR-172364; NAS 1.26:172364) Avail: NTIS HC A02/MF A01 CSCL 20E

The potential of solid phase endoperoxides as a means to produce single-delta oxygen in the gas phase in concentrations useful to chemical oxygen-iodine lasers was investigated. The 1,4 - endoperoxide of ethyl 3- (4-methyl - 1-naphthyl) propanoate was deposited over an indium-oxide layer on a glass plate. Single-delta oxygen was released from the endoperoxide upon heating the organic film by means of an electrical discharge through the conductive indium oxide coating. The evolution of singlet-delta oxygen was determined by measuring the dimol emission signal at 634 nm. Comparison of the measured signal with an analytic model leads to two main conclusions: virtually all the oxygen being evolved is in the singlet-delta state and in the gas phase, and there is no significant quenching other than energy pooling on the time scale of the experiment (approximately 10 msec). The use of solid phase endoperoxide as a singlet-delta oxygen generator for an oxygen-iodine laser appears promising. Author

N84-28900*# Control Dynamics Co., Huntsville, Ala.
ANALYSIS OF SSME HPOTP ROTORDYNAMICS SUB-SYNCHRONOUS WHIRL Final Report
Mar. 1984 153 p refs
(Contract NAS8-35053)
(NASA-CR-171094; NAS 1.26:171094;
Rept-0340284FR-NA17-SSM04) Avail: NTIS HC A08/MF A01 CSCL 21H

The causes and remedies of vibration and subsynchronous whirl problems encountered in the Shuttle Main Engine SSME turbomachinery are analyzed. Because the nonlinear and linearized models of the turbopumps play such an important role in the analysis process, the main emphasis is concentrated on the verification and improvement of these tools. It has been the goal of our work to validate the equations of motion used in the models are validated, including the assumptions upon which they are based. Verification of th SSME rotordynamics simulation and the developed enhancements, are emphasized. M.A.C.

N84-28901*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Government Products Div.
NASA ORBIT TRANSFER ROCKET ENGINE TECHNOLOGY PROGRAM Final Report
23 Apr. 1984 104 p refs
(Contract NAS3-23171)
(NASA-CR-168156; NAS 1.26:168156) Avail: NTIS HC A06/MF A01 CSCL 21H

The advanced expander cycle engine with a 15,000 lb thrust level and a 6:1 mixture ratio and optimized performance was used as the baseline for a design study of the hydrogen/oxgyen propulsion system for the orbit transfer vehicle. The critical components of this engine are the thrust chamber, the turbomachinery, the extendible nozzle system, and the engine throttling system. Turbomachinery technology is examined for gears, bearing, seals, and rapid solidification rate turbopump shafts. Continuous throttling concepts are discussed. Components of the OTV engine described include the thrust chamber/nozzle assembly design, nozzles, the hydrogen regenerator, the gaseous oxygen heat exchanger, turbopumps, and the engine control valves. A.R.H.

N84-28902# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
POWER PLANTS IN SPACE
W. Wiktorow 1 Jun. 1984 9 p Transl. into ENGLISH from Skrzydlata Polska (Poland), no. 39(1420), 24 Sep. 1978 p 21
(AD-A142099; AD-F300432; FTD-ID(RS)T-0615-84) Avail: NTIS HC A02/MF A01 CSCL 10/2

In astronautical equipment, electrical energy serves to power automatic control systems, radio communications and scientific equipment. The basic means for obtaining this energy is by transforming solar energy into electricity. The adaptation of photovoltaic converts to space flight is described. B.G.

N84-28903# Societe Nationale Industrielle Aerospatiale, Cannes (France). Div. Systemes Balistiques et Spatiaux.
STUDY OF CONCENTRATION FOR SPACE PHOTOVOLTAIC GENERATOR: EXECUTIVE SUMMARY
Paris ESA 13 Dec. 1983 24 p
(SNIAS-2726-CA/EM/G; ESA-CR(P)-1872) Avail: NTIS HC A02/MF A01

Space photovoltaic generator concentration solutions which meet the requirements of low Earth orbit, and deep space applications, and the possibility of using concentration on geosynchronous orbit missions were studied. For distributed concentration, metallization of composite reflector materials; SSM bonding; reflective coatings; procurement of cold mirror; and design and sizing of heat dissipating devices were investigated. For global concentration, reflector deployment mechanism and tensioning system; optical quality; and electrical discharge were studied. An electro-thermal study and study of protection system of the electrical network were performed. Use of concentration is always foreseeable, and at times necessary to improve the general performances of the solar array subsystems. This change does not put excessive demands on other subsystems such as attitude control and power conditioning. Author (ESA)

N84-28904# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany). Abteilung RX013.
STUDY REPORT ON A MODULAR PHOTOVOLTAIC POWER SUPPLY SYSTEM FOR SPACE APPLICATION Final Report, Jun. 1983
Manfred Baune, Helmut Bittner, Gert Eggers, Bernd Goergens, Hans-Juergen Huettmann, Karsten Huse, Uwe Mansholdt, Martin Roth, Karl Schneider, and Wolfgang Westphal Bonn Bundesministerium fuer Forschung und Technologie Mar. 1984 212 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-010; ISSN-0170-1339) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 37

A modular photovoltaic spacecraft power supply system with power output 10 to 30 kW is considered. Electrical and mechanical aspects, dynamic behavior, large array control and stabilization, blanket design, power conditioning, energy storage, and cost planning were studied. Test results suggest a multichannel conception with separate solar generator charge sections, a primary power generating system of 100 V, and a modular solar array fuel cells parallel working system. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N84-28905# Department of Energy, Washington, D. C. Div. of Materials Sciences.
MATERIALS SCIENCES PROGRAMS, FISCAL YEAR 1983
Sep. 1983 219 p
(DOE/ER-0143/1) Avail: NTIS HC A10/MF A01

An index of 508 research programs relating to materials science is presented. Each program is abstracted and cross-indexed by material type, techniques, phenomena, environment, and investigators. Metallurgy, ceramics, solid state physics, and materials chemistry are the primary topics considered under the rubric of materials science. R.S.F.

N84-28906# Vermont Univ., Burlington. Dept. of Chemistry.
ORGANOPHOSPHAZENES: 17: THE SYNTHESIS OF TRIMETHYLSILYLACETYLENE AND TERMINAL ACETYLENE DERIVATIVES OF HEXFLUOROCYCLOTRIPHOSPHAZENE
C. W. Allen, J. L. Desorcie, and K. Ramachandran 18 May 1984

18 p
(Contract N00014-77-C-0605)
(AD-A141429; TR-14) Avail: NTIS HC A02/MF A01 CSCL 07/3

The reactions of lithio trimethylsilylacetylene, LiC=CSiMe3, with hexafluorocyclotriphosphazene, N3P3F6, lead to the new alkynphosphazenes N3P3F6, lead to the new alkynphosphazenes N3P3F6-n(C=SCiMe3)n (n=1,2). Both the geminal and nongeminal isomers are observed in the 31P and 19F n.m.r. spectra. A reinvestigation of the reaction of lithio phenylacetylene, LiC=CPh, with N3P3F6 showed that, at the stage of bis substitution, in addition to the previously reported major product, gem-N3P3F4 (C=C Ph)2, small amounts of the non-geminal N3P3F4 (C=CPh)2 isomers are formed. The reactions of N3P3F6-n (C=CSiMe3)n (n=1,2) with potassium fluoride in anhydrous ethanol leads to the terminal acetylene derivatives, N3P3F4-n (OC2H5)2(C=CH)n (n=1,2). GRA

N84-28907# Texas Christian Univ., Fort Worth. Dept. of Chemistry.
A TWISTED P-C DOUBLE BOND: SYNTHESIS AND STRUCTURE OF A (METHYLENE)PHOSPHINE Fe-CO-4 COMPLEX
R. H. Neilson, R. J. Thoma, I. Vickovic, and W. H. Watson 18 May 1984 11 p
(Contract N00014-79-C-0632)
(AD-A141502; TCU/DC/TR-84-05) Avail: NTIS HC A02/MF A01 CSCL 07/2

The reaction of (Me3Si)2C=PCl with LiN(SiMe3)2 affords the tetrasilylated amino(methylene)phosphine 1 which, reacts smoothly with Fe2(CO)9 yielding the eta super 1 complex (Me3Si)2C=P(Fe (CO)4)-N(SiMe3)2 (2). X-ray crystallographic analysis of 2 reveals an unusual coordination of the phosphine ligand in an equatorial position as well as a short (1,657 A), but severely twisted (30.3 deg), P = C double bond. Author (GRA)

N84-28908# Texas Christian Univ., Fort Worth. Dept. of Chemistry.
SUBSTITUTION AND ADDITION REACTIONS OF A (METHYLENE)PHOSPHINE WITH ALKYLLITHIUM REAGENTS
B. L. Li and R. H. Neilson 18 May 1984 12 p
(Contract N00014-79-C-0632)
(AD-A141512; TCU/DC/TR-84-04) Avail: NTIS HC A02/MF A01 CSCL 07/3

Treatment of the (methylene)phosphine (Me3Si) 2NP=CHSiMe3 (1) with alkyllithium reagents and Me3SiCl affords either the diphosphinomethane derivative R2P-CH(SiMe3)-P(R)CH (SiMe3)2 (2, R = Me) or the trialkylphosphine R2PCH(SiMe3)2 (3, R = t-Bu). A reaction pathway involving both nucleophilic substitution and addition reactions at the P=C moiety is suggested. Compound 2 exhibits hindered rotation about the P-CH (SiMe3)2 bond with a measured delta G+ sub c of 17.7 kcal/mole. Author (GRA)

N84-28909# Texas Christian Univ., Fort Worth. Dept. of Chemistry.
SYNTHESIS AND STRUCTURE OF SULFUR DERIVATIVES OF A (METHYLENE)PHOSPHINE Technical Report, for period ending 1983
M. Caira, R. H. Neilson, W. H. Watson, P. Wisian-Neilson, and Z. M. Xie 18 May 1984 10 p
(Contract N00014-79-C-0632)
(AD-A141513; TCU/DC/TR-84-03) Avail: NTIS HC A02/MF A01 CSCL 07/3

The methylenephosphine MesP = C (SiMe3)2 (1, Mes = mesityl) is smoothly oxidized by elemental sulfur to the 3-membered is smoothly oxidized by elemental sulfur to the 3-membered ring system MesP(=S)-S-C(SiMe3)2 (3) which, upon treatment with n-Bu3P, is converted to the 3-coordinate phosphorane MesP(=S) =C(SiMe3)2 (2). The nearly isostructural nature of compounds 2 and 3 is confirmed by their X-ray crystallographic analyses. Author (GRA)

N84-28910# University of Southern California, Marina del Rey. Information Sciences Inst.
REUSE IN THE CONTEXT OF A TRANSFORMATION BASED METHODOLOGY
M. S. Feather Apr. 1984 00014 p Presented at the Workshop on Reusability in Programming, Newport, 7-9 Sep. 1983
(Contract MDA903-81-C-0335)
(AD-A141514; ISI/RS-83-125) Avail: NTIS HC A02/MF A01 CSCL 09/2

The research group at ISI aims to improve the program development process by applying program transformation to develop implementations for specifications. Following this methodology, the development of a piece of software involves its specification in a formal specification language, and subsequent machine-assisted transformation of that specification into an implementation (conventional program). Subsequent maintenance and modification of software developed in this manner is achieved by modifying the specification, and reperforming the transformational development to derive a new implementation. Thus reuse occurs through reusing the original specification, and reusing the original transformational development of that specification. The approach is distinguished by the nature of our specification language, which has been designed to minimize the gap between informal conceptualization and formal specification. A beneficial result of this is that maintenance and modification at the specification level is relatively straightforward. Further, the techniques that are applied in transforming specifications into implementations are themselves applied repeatedly, and serve to capture our programming knowledge in a conveniently reusable manner. Consideration of an example drawn from the domain of process control illustrates these points. Author (GRA)

N84-28911# Systems Research Labs., Inc., Dayton, Ohio.
EFFECTS OF IONIZING RADIATION AND RESTRAINT STRESS ON ACTIVITY, AVOIDANCE CONDITIONING, AND STOMACH ULCERS IN ALBINO RATS Final Report, Oct. 1980 - Dec. 1981
J. Lanum, D. W. Blick, M. E. Campbell, T. G. Wheeler, and S. A. Koger Brooks AFB, Tex. School of Aerospace Medicine Mar. 1984 33 p
(Contract F33615-80-C-0603; AF Proj. 7757)
(AD-A141515; USAFSAM-TR-84-1) Avail: NTIS HC A03/MF A01 CSCL 06/18

In an experiment with albino rats, we have tried to model a nuclear attack scenario in which military personnel receiving 600 to 800 rads of ionizing radiation would be making a counterattack under the stress of an emergency situation. We used a dose of radiation that, though higher than the human exposure field, was estimated to be its physiological equivalent. Restraining the rat in an immobile position, a technique previously shown to have stressing qualities for rats, was chosen as an analogy to the stress of being in a war emergency. Activity and conditioned avoidance acquisition were chosen as test responses. Performance in the activity maze was affected only to a minor degree and in the direction of considering irradiation as activating. However, all irradiated groups showed retarded conditioned avoidance acquisition, which can be interpreted as decreased adaptability to a stressful situation. Further, our results support the expectation of performance decrements in the military scenario that could not be predicted by considering ionizing radiation in isolation. On the avoidance task, male rats in the combination stress-irradiation condition showed more failures to respond and longer response latencies than any other group. Female rats, on the other hand, showed shorter escape/avoidance latencies in the combined stress-irradiation condition than in the irradiation condition alone. This sex difference may be useful as a clue for investigating mechanisms of radiation resistance and interactions between stressors. GRA

N84-28912# Union Carbide Corp., Tarrytown, N.Y.
ORGANOSILANE POLYMERS. PART 7: SODIUM-DERIVED VINYLIC POLYSILANES
C. L. Schillings, Jr. Sep. 1983 20 p

(Contract N00014-81-C-0682)
(AD-A141649; TR-83-3) Avail: NTIS HC A02/MF A01 CSCL 07/3

Dechlorination of mixtures of CH2=CHSiMeC12 with other chlorosilanes, using sodium metal in hydrocarbon/THF solvent blends, provides vinylic polysilanes which are excellent precursors for silicon carbide ceramic compositions. These polymers are soluble, relatively inert, and are thermally curable through reactions of the vinyl groups. Author (GRA)

N84-28913# North Dakota State Univ., Fargo. Dept. of Chemistry.
NEW APPROACHES TO THE SYNTHESIS OF NOVEL ORGANOSILANES Final Report, 1 Sep. 1980 - 31 Dec. 1983
P. Boudjouk Oct. 1983 16 p
(Grant AF-AFOSR-0239-80; AF Proj. 2303)
(AD-A141803; AFOSR-84-0439TR) Avail: NTIS HC A02/MF A01 CSCL 07/3

Three major efforts in organosilicon chemistry were initiated during the tenure of this grant: (1) synthetic organosilicon electro-chemistry; (2) synthetic applications of Lewis Acid catalyzed redistribution reaction; and, (3) synthetic applications of ultrasonic waves. All three projects were successful to varying degrees. In electrochemistry, the first electrochemical characterizations of functionalized organosilanes was carried out and will be submitted for publication during 1984. Additionally, the first syntheses of a variety of disilanes from chlorosilanes under controlled potential conditions was affected. The redistribution reaction was successfully applied to prepare cyclic and caged silanes. A wide variety of cyclics were synthesized in good yield. Ultrasonic irradiation of heterogeneous reactions was found to greatly accelerate reaction rates giving a narrow distribution of products in high yields. Improved yields under milder conditions for many reactions were observed. Author (GRA)

N84-28914# Technische Hochschule, Aachen (West Germany). Lehrgebiet Technische Chemie und Petrolchemie.
CHEMICAL UTILIZATION OF THE OLEFINIC BYPRODUCTS IN PYROLYSIS NAPHTHA BY CARBONYLATION AND ALKYLATION REACTION Final Report, Jun. 1982
Bernhard Fell, Ulrich Buller, Herbert Classen, Joachim Schulz, and Juergen Egenolf Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 149 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-064; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 31,50

Hydrocarbalkoxylation with cobalt carbonyl/pyridine-complex catalysts was used for the conversion of 1.3-dienes of pyroliysis naphtha to beta-gamma unsaturated carboxylic esters. Quantitative hydrocarboxylation of the styrene in the C8-cut of the pyrolysis naphtha succeeds with the same complex catalyst system. The hydrofined pyrolysis naphtha, which contains only monoolefins, is a raw material for the hydroformulation reaction to C6/C7-aldehydes which can be transformed to C12/C14-alcohols by aldol condensation reaction. The alkylation reaction to the benzene in refined pyrolysis naphtha with the C5-olefins gives isopentyl benzene. Further alkylation with isononene, followed by sulfonation gives dialkylbenzene sulfonates suited for chemical flooding in enhanced oil recovery. Author (ESA)

24 COMPOSITE MATERIALS

Includes laminates.

N84-28915*# Boeing Commercial Airplane Co., Seattle, Wash.
ADVANCED COMPOSITE STABILIZER FOR BOEING 737 AIRCRAFT Quarterly Technical Progress Report, 19 Apr. - 18 Jul. 1978
18 Jul. 1978 150 p
(Contract NAS1-15025)
(NASA-CR-157639; NAS 1.26:157639; QTPR-4; DRL-018) Avail: NTIS HC A07/MF A01 CSCL 11D

Activities related to development of an advanced composites stabilizer for the Boeing 737 commercial transport are reported. Activities include discussion of criteria and objectives, design loads, the fatigue spectrum definition to be used for all spectrum fatigue testing, fatigue analysis, manufacturing producibility studies, the ancillary test program, quality assurance, and manufacturing development. M.A.C.

N84-28916*# National Aeronautics and Space Administration, Washington, D. C.
HOT-PRESSED SILICON NITRIDE WITH VARIOUS LANTHANIDE OXIDES AS SINTERING ADDITIVES
Kazuo Ueno and Yasuo Toibana Apr. 1984 15 p refs Transl. into ENGLISH from Yogyo Kyokai Shi (Tokyo), v. 91, no. 9, 1983 p 409-414 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Government Industrial Research Inst., Osaka, Japan
(Contract NASw-3541)
(NASA-TM-77424; NAS 1.15:77424) Avail: NTIS HC A02/MF A01 CSCL 11D

The effects of addition of various lanthanide oxides and their mixture with Y2O3 on the sintering of Si3N4 were investigated. The addition of simple and mixed lanthanide oxides promoted the densification of Si3N4 in hot-pressing at 1800 C under 300-400kg/centimeters squared for 60 min. The crystallization of yttrium and lanthanide-silicon oxynitrides which was observed inn the sintered body containing yttrium-lanthanide mixed oxides as additives led to the formation of a highly refractory Si3N4 ceramic having a bending strength of 82 and 84 kg/millimeters squared at room temperature and 1300 C respectively. In a Y2O3+La2O3 system, a higher molar ratio of La2O3 to Y2O3 gave a higher hardness and strength at high temperatures. It was found that 90 min was an optimum sintering time for the highest strength. R.J.F.

N84-28917*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF LONG-TIME ELEVATED TEMPERATURE EXPOSURES ON HOT-ISOSTATICALLY-PRESSED POWER-METALLURGY UDIMET 700 ALLOYS WITH REDUCED COBALT CONTENTS
Fredric H. Hart 1984 18 p refs Presented at 113th Ann. Meeting of the Am. Inst. of Mining and Metallurgical and Petroleum Engr., Los Angeles, 26 Feb. - 2 Mar. 1984
(NASA-TM-83632; E-2071; NAS 1.15:83632) Avail: NTIS HC A02/MF A01 CSCL 11D

Because almost the entire U.S. consumption of cobalt depends on imports, this metal has been designated 'strategic'. The role and effectiveness of cobalt is being evaluated in commercial nickel-base superalloys. Udiment 700 type alloys in which the cobalt content was reduced from the normal 17% down to 12.7%, 8.5%, 4.3%, and 0% were prepared by standard powder metallurgy techniques and hot isostatically pressed into billets. Mechanical testing and microstructural investigations were performed. The mechanical properties of alloys with reduced cobalt contents which were heat-treated identically were equal or better than those of the standard alloy, except that creep rates tended to increase as cobalt was reduced. The effects of long time exposures at 760 C on mechanical properties and at 760 C and 845 C on microstructures were determined. Decreased tensile properties and shorter rupture lives with increased creep rates were observed in alloy modifications. The exposures caused gamma prime particle coarsening and formation of sigma phase in the alloys with higher cobalt contents. Exposure at 845 C also reduced the amount of MC carbides. Author

N84-28918*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HYGROTHERMOMECHANICAL FRACTURE STRESS CRITERIA FOR FIBER COMPOSITES WITH SENSE-PARITY
C. C. Chamis and C. A. Ginty [1983] 15 p refs Presented at

the 7th Conf. on Composite Mater.: Testing and Design, Philadelphia, 2-5 Apr. 1984; sponsored by Am. Soc. for Testing and Mater.
(NASA-TM-83691; E-2146; NAS 1.15:83691) Avail: NTIS HC A02/MF A01 CSCL 11D

Hygrothermomechanical fracture stress criteria are developed and evaluated for unidirectional composites (plies) with sense-parity. These criteria explicity quantify the individual contributions of applied, hygral and thermal stresses as well as couplings among these stresses. The criteria are for maximum stress, maximum strain, internal friction, work-to-fracture and combined-stress fracture. Predicted results obtained indicate that first ply failure will occur at stress levels lower than those predicted using criteria currently available in the literature. Also, the contribution of the various stress couplings (predictable only by fracture criteria with sense-parity) is significant to first ply failure and attendant fracture modes. Author

N84-28919*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
FREE EDGE STRAIN CONCENTRATIONS IN REAL COMPOSITE LAMINATES: EXPERIMENTAL-THEORETICAL CORRELATION Interim Report
C. T. Herakovich, D. Post, M. B. Buczek (General Electric), and R. Czarnek Jul. 1984 36 p refs
(Contract NCC1-15; Grant NSF MEA-81-09250)
(NASA-CR-173818; NAS 1.26:173818; CCMS-84-10; VPI-E-84-24; IR-46) Avail: NTIS HC A03/MF A01 CSCL 11D

The magnitude of the maximum shear strain at the free edge of axially loaded [theta (2)/-theta(2)](s) and [(+ or - theta(2))(s) composite laminates was investigated experimentally and numerically to ascertain the actual value of strain concentration in resin matrix laminates and to determine the accuracy of finite element results. Experimental results using moire interferometry show large, but finite, shear strain concentrations at the free edge of graphite-epoxy and graphite-polyimide laminates. Comparison of the experimental results with those obtained using several different finite element representations showed that a four node isoparametric finite element provided the best and most trouble free numerical results. The results indicate that the ratio of maxium shear strain at the free edge to applied axial strain varies with fiber orientation and does not exceed nine for the most critical angle which is 15 deg. Author

N84-28920# California Univ., Livermore. Lawrence Livermore Lab.
MATRIX-DOMINATED TIME-DEPENDENT DEFORMATION AND DAMAGE OF GRAPHITE EPOXY COMPOSITE -- EXPERIMENTAL DATA UNDER MULTIPLE-STEP RELAXATION Interim Report, Jan. 1979 - Dec. 1980
E. M. Wu, N. Q. Nguyen, and R. L. Moore Wright-Patterson AFB, Ohio AFWAL May 1983 506 p
(Contracts W-7405-eng-48; MIPR-FY1456-81-0014; AF Proj. 2307)
(AD-A141697; UCID-19765; AFWAL-TR-83-3056) Avail: NTIS HC A22/MF A01 CSCL 11/9

The objective of this report is to disseminate experimental data of matrix-dominated time-dependent deformation and time-dependent damage in graphite-epoxy composite. The composite specimens were + or - 45 degrees T300/5208 laminates tested in extension with complete instrumentation for stress, strain, and time recordings. Experimental data was recorded and archived in digital form. Noises in the data were minimized by digital elimination of the wild points in the excitation voltage and by a digital valuable low pass frequency filter with the cut-off frequency matched to the expected materials response. The data were presented both graphically and numerically. Data presented herein is accessible to the technical community at large for correlation and the formulation of theory from diverse perspectives, and to meet different goals in fundamental research and engineering applications. Author (GRA)

N84-28921# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering and Applied Mechanics.
STRENGTH OF BOLTED JOINTS IN LAMINATED COMPOSITES Final Report, Jun. - Dec. 1983
F. K. Chang, R. A. Scott, and G. S. Springer Wright-Patterson AFB, Ohio AFWAL Mar. 1984 176 p
(Contract F33615-81-C-5050)
(AD-A141826; AFWAL-TR-84-4029) Avail: NTIS HC A09/MF A01 CSCL 11/4

A method is presented for predicting the failure strength and failure mode of pin loaded holes in fiberite reinforced composite laminates. The method includes two steps. First, the stress distribution in the laminate is calculated by the use of a finite element method. Second, the failure load and failure mode are predicted by means of a proposed failure hypothesis together with the Yamada-Sun failure criterion. A computer code was developed, which can be used to calculate the maximum load and the mode of failure of joints involving laminates with different ply orientations, different material properties, and different geometries. Tests were performed, measuring the rail shear strength and the characteristic lengths for Fiberite composites. Tests were also conducted, measuring the failure strengths and failure modes of Fiberite laminates containing a pin loaded hole or two pin loaded holes in parallel or in series. Comparisons were made between the data and the results of the model. Good agreement was found between the analytical and the experimental results. Using the computer code, parametric studies were performed, illustrating the procedures which can be used to size composites containing pin loaded holes. GRA

N84-28922# Massachusetts Inst. of Tech., Cambridge.
TRANSFORMATION PLASTICITY IN HIGH-STRENGTH MATERIALS Progress Report, 1 Aug. 1983 - 31 Jul. 1984
G. B. Olson and I. W. Chen Mar. 1984 21 p refs
(Contract DE-AC02-83ER-45029)
(DE84-008655; DOE/ER-45029/1) Avail: NTIS HC A02/MF A01

Precipitation-strengthened austenitic steels with a constant yield strength, varying thermodynamic stability, and varying transformation volume change has allowed the determination of the enhancement of uniform ductility, tensile fracture strain, and J/sub IC/ fracture toughness via transformation plasticity. Under conditions of shear-instability-controlled fracture, transformation dilatation enhances toughness, but is not essential to transformation toughening. The toughening behavior is qualitatively consistent with models of void-induced shear instability. Experiments on the transformation behavior of dispersed ZrO2 particles using model Nb-ZrO2 composites demonstrate heterogeneous-nucleation-controlled kinetics. The size dependence of the particle stability is explained using a nucleation site potency distribution function which applies to both metals and ceramics. A limiting particle size exists below which the size effect is absent. TEM investigation of the transformation behavior of extracted defect-free small particles allows direct observation of nucleation in the stress field generated at the bicrystal interface of contacting particles. DOE

N84-28923# Virginia Polytechnic Inst. and State Univ., Blacksburg.
ANALYTICAL MODEL OF STRENGTH LOSS IN FILAMENT WOUND SPHERICAL VESSELS Final Report, 1 Oct. 1981 - 30 Sep. 1983
P. J. Leavesley and C. E. Knight, Jr. Nov. 1983 225 p refs
(Contract DE-AC05-84OS-21400)
(DE84-010213; Y/Sub-80-7733/201) Avail: NTIS HC A10/MF A01

The ability to predict potential strength degradation of a filament wound sphere was developed using an incremental finite element model of the composite during fabrication. The sphere was modeled taking into account the winding/loading pattern and the resulting internal layer boundaries. A thickness profile of the sphere's layers was computed and used by the mesh generating program to ensure that the elements generated die not cross layer boundaries. Results show that strength degradation definitely occurs when the average fiber layer strain is negative. The negative strain means that all the winding tension has been lost from the layer and the fibers in uncured resin will buckle when they try to support compressive loading. Then when the resin cares the

buckled region, fibers are degraded in strength. This model gives a layer by layer analysis of the potential strength loss of the composite. DOE

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N84-28924 Central Electricity Generating Board, London (England).
MECHANISM AND KINETICS OF THE OXIDATION OF THE IODIDE ION BY OXYGEN
E. Abel 5 Apr. 1984 16 p refs Transl. into ENGLISH from Monatsh. (Austria), v. 83, 1952 p 818-828 Presented at meeting on 24 Apr. 1952
(BLL-CE-Trans-8005-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.

Oxidation of hydriodic acid by oxygen shows particular features in two directions: in contrast to most types of oxidation by oxygen the oxidation rate rises as the acidity increases and it is accelerated by the oxidation product iodine, i.e., auto catalytrically. A mechanism is developed which, in the kinetics arising out of it, is in keeping with both features. The mechanism leads via parallel paths to the iodine being oxidized to the iodine atom on the one hand, and the iodine atom being oxidized to the iodine cation on the other hand. The experimental results agree satisfactorily with the kinetics obtained. Author

N84-28925 Central Electricity Generating Board, London (England).
PHOTOCHEMICAL OXIDATION OF HYDROGEN IODIDE BY OXYGEN
J. Plotnikow 5 Apr. 1984 17 p Transl. into ENGLISH from Z. Phys. Chem. (West Germany), v. 64, 1908 p 215-228
(BLL-CE-Trans-7989-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.

The rate of the reaction in darkness varies in proportion to (HCl)4/3 and the rate of the light reaction varied proportionally with (HCl)4/5 (where (HCl) is the concentration of hydrochloric acid); in other words, the exponent is changed by the light. At the same time the suggestion was made that this change of exponent could be due to the presence of positive catalysts in HCl, whose action, in comparison with the greatly accelerating action of light, was very slight and was masked during irradiation. A general formula was presented of the rate of this photo catalytical reaction, in which the entire velocity is shown as a sum of the velocities of the dark and light reaction, or in other words, the idea was put forward that the properties of a photo catalytical reaction are additive. Author

N84-28926 Central Electricity Generating Board, London (England).
PHOTOCHEMICAL OXIDATION OF HYDROGEN IODIDE BY OXYGEN
J. Plotnikow 5 Apr. 1984 34 p Transl. into ENGLISH from Z. Phys. Chem. (West Germany), v. 58, 1907 p 214-244
(BLL-CE-Trans-7988-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.

The photokinetics of the photochemical oxidation of hydrogen iodide by oxygen is investigated. Tests are conducted under light and dark conditions. Reaction equations are included. The effects of temperature and the addition of various solutions on the reaction kinetics are examined. M.A.C.

N84-28927*# National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATION OF THE INFLUENCE OF THE ZETA-POTENTIAL ON THE FILTRATION RATE IN THE PRESENCE OF COLLECTORS
E. V. Provirnina and M. B. Barbin May 1984 7 p refs Transl. into ENGLISH from Izv. Vyssh. Uch. Zaved., Gornyy Zh. (USSR), v. 17, no. 2, 1974 p 160-163 Transl. by Scientific Translations, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77447; NAS 1.15:77447) Avail: NTIS HC A02/MF A01 CSCL 07D

The value of the zeta-potential does not have an explicit effect, which is expressed by a simple math correlation, on filtration rate when a solution of the tested collector is filtered through a cake prepared under standard conditions from the examined particulate material. The zeta-potential measurements and filtration tests were carried out on silica and galena with solutions contg. a cationic container ANP and Et xanthane, resp. at PH = 6.5, varying concentration of the agent (0-2500 g/ton), and under a vacuum of 100 to 600 mm Hg. Author

N84-28928*# Wake Forest Univ., Winston-Salem, N.C. Dept. of Chemistry.
QUANTUM CHEMICAL STUDY OF METHANE OXIDATION SPECIES Status Report, 4 Dec. 1983 - 3 Jun. 1984
Charles F. Jackels 3 Jun. 1984 54 p refs
(Contract NCC1-55)
(NASA-CR-173819; NAS 1.26:173819) Avail: NTIS HC A04/MF A01

Work completed on the 2A1 excited state and low-lying dissociative states of the methoxy radical is reported. A manuscript was prepared that reports the characterization of the 2A1 electronic state, the excitation energies and Franck-Condon factors for the 2A1 - 2E system, and the energies of intersection between the 2A1 state and the nearby dissociative states. The minimum excitation energy needed for predissociation of methoxy is predicted along with the corresponding implications for atmospheric chemistry. M.G.

N84-28929*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SPIN-POLARIZED TRIPLET HELIUM Interim Report, Jul. 1983 - Jan. 1984
J. S. Zmuidzinas Edwards AFB, Calif. Air Force Rocket Propulsion Lab. Apr. 1984 46 p
(Contract MIPR-RPL-39004)
(NASA-CR-173787; NAS 1.26:173787; AD-A141054; AFRPL-TR-84-027) Avail: NTIS HC A03/MF A01 CSCL 07B

It is pointed out that bulk quantities of spin-polarized Triplet He* (2 Superscript 3 subscript 1) and Triplet He2* He2(a Superscript 3 sigma subscript u (+) should form insulating classical solids, respectively denoted as He IV-A and He IV-M. Estimates of some basic physical properties of He IV-A are given. A metallic phase of He IV-A is considered and modeled by a two-component Fermi fluid of spin-polarized He(+), ions and electrons. This metallic phase is predicted to occur at r subscript s approx. 2.3 and to lie considerably lower in energy than insulating He IV-A(M), making it the preferred phase to be looked for experimentally. A number of deexcitation mechanisms of atomic, dimerized, and bulk He* are identified, and the open problem of stability is discussed. A method is proposed to produce He IV-M, and ultimately metallic He IV-A, by optically pumping the He2* species produced by electron bombardment of superfluid helium. Author (GRA)

N84-28930# Indiana Univ., Bloomington. Dept. of Chemistry.
REACTIONS OF METAL-METAL MULTIPLE BONDS. PART 14: SYNTHESIS AND CHARACTERIZATION OF TRIANGULO-W3 AND Mo2W-oxo CAPPED ALKOXIDE CLUSTERS. COMPROPORTIONATION OF M-M TRIPLE BONDS, SIGMA(2)PI(4) AND d(O) METAL-oxo GROUPS: M TRIPLE BOND M + M TRIPLE BOND O YIELDS M3(MICRON 3-O)
M. H. Chisholm, K. Folting, J. C. Huffman, and E. M. Kober 2 May 1984 32 p Submitted for publication
(Contract N00014-79-C-0044)
(AD-A141067; INDU/DC/TR-84/1-MC) Avail: NTIS HC A03/MF A01 CSCL 07/2

In hydrocarbon solvents W2(O-i-Pr)6 (HNMe 2)2 and WO(O-i-Pr)4 react to give W3O(O-i-Pr)10. Similarly Mo2(O-i-Pr)6 and

WO(O-i-Pr)4 yield the mixed metal cluster Mo2WO(O-i-Pr)10 but the reaction between W2(O-i-Pr)6(HNMe2)2 and MoO(O-i-Pr)4 proceeds further to give by oxo group transfer WO(O-i-Pr)4 along with other products. Attempted comproportionations involving Mo2(O-i-Pr)6 and W2(O-i-Pr)6(HNMe2)2 with either M(O-i-Pr)5(M = Nb and Ta) or W(NPh)(O-i-Pr)4 and failed to react. The new triangulo oxo capped alkoxides are isomorphous and isostructural with the previously reported Mo3O(O-i-Pr)10 compound. The electronic absorption spectra and electrochemical data are consistent wtih a common electronic structure and a gradation of properties for the replacement of Mo by W. Author (GRA)

N84-28931# Colorado State Univ., Fort Collins.
SUPERSONIC MOLECULAR JET STUDIES OF TOLUENE-HELIUM AND TOLUENE-METHANE CLUSTERS
M. Schauer, K. Law, and E. R. Bernstein 15 May 1984 41 p
(Contract N00014-79-C-0647)
(AD-A141379; TR-13) Avail: NTIS HC A03/MF A01 CSCL 07/4

The techniques of fluorescence excitation (FE), dispersed emission (DE), and 1- and 2-color time of flight mass spectroscopy (TOFMS) have been employed to study van der Waals clusters of toluene-helium (To1He) and toulene-methane (TolCH4) formed in a supersonic molecular jet. Spectral shifts for the toluene 1 A sub 1 to 1 B sub 2 transition have been characterized for TolHe1,2 and To1(CH4)1,2. The van der Waals stretching frequencies (V1) in the excited states of these clusters have been identified. The ground state stretch (V1) for TolHe has also been found; it is quite similar to the TolHe V1. The binding energies (Do) for Tol-He clusters lie between 75 and 90/cm and those for Tol-CH4 clusters lie between 533 and 739/cm. The coordination of a third solvent molecule to those clusters generates a broad spectrum whose shift is close to the limiting value for a large (X greater than) cluster. A comparison between these data and methane solution data is presented. GRA

N84-28932# Army Military Personnel Center, Alexandria, Va.
APPLICATION OF THE FINITE COMPARTMENT MODEL OF CARBON ADSORPTION TO BINARY SYSTEMS M.S. Thesis
T. R. Noreen May 1984 117 p
(AD-A141483; AD-E850690) Avail: NTIS HC A06/MF A01 CSCL 07/4

Successful treatment of wastewater and potable water supplies requires an accurate method of predicting bed size and service life. The design method used must effectively model multicomponent solute systems. The objective of this research is to apply the n-Finite Compartment Model to the binary system of chloroform and methyl isobutyl ketone using a microcolumn technique. An additional objective is to determine whether there exists a functional relationship between microcolumn and carbon particle diameters which affects the adsorption process. The microcolumn technique is a cost effective method of dynamically modeling the adsorption process. Reproducible breakthrough curves are obtained in a few hours using a minimal amount of carbon. The resulting breakthrough curves are numerically evaluated using the method of moments. A linear relationship, independent of column diameter, is found between the first moment and column length. Characteristics of competitive adsorption are observed when comparing the moments of pure component and binary solutions. Moments are not affected by column diameter. GRA

N84-28933# Stanford Univ., Calif. Dept. of Chemistry.
STUDY OF GAS-SURFACE INTERACTIONS BY LASER-INDUCED FLUORESCENCE DETECTION Final Report, Jun. 1980 - Dec. 1983
R. N. Zare 1 May 1984 7 p
(Contract DAAG29-80-K-0035)
(AD-A141559; ARO-17355.5-CH) Avail: NTIS HC A02/MF A01 CSCL 07/4

The scattering of nitric oxide (NO) from a clean single-crystal of silver THE (111) FACE has been studied. The rotational and fine structure distributions of NOXsq pi have been determined as a function of surface temperature and of incident kinetic energy normal to the surface plane. The analysis technique is that of laser-induced fluorescence using a Nd:YAG pumped dye laser which is both frequency doubled and Raman shifted to overlap the NO(gamma) band system in the UV. It is found that the energy transferred into the NO rotational degree of freedom in a single gas-surface encounter is expressed by where E sub r is the mean rotational energy, E sub n the normal component of the NO kinetic energy, E sub s the surface temperature, E sub w a parameter characterizing the NO/Ag(111) well depth, and a and b are coefficients that express the fraction of kinetic and surface energy appearing as rotational excitation. GRA

N84-28934# Wisconsin Univ., Madison. Mathematics Research Center.
TWO-STEP SEQUENTIAL REACTIONS FOR LARGE ACTIVATION ENERGIES-REVISITED Technical Summary Report
H. V. McConnaughey and G. S. S. Ludford Apr. 1984 18 p
(Contracts DAAG29-80-C-0041; DAAG29-81-K-0127)
(AD-A141750; MRC-TSR-2672) Avail: NTIS HC A02/MF A01 CSCL 12/1

One-dimensional, steady flame propagation for a sequential, two-step reaction of the form A yields B yields C is considered. An earlier investigation of the problem determines that two separated flames generally exist and that their ordering is fixed by the ordering of the (disparate) magnitudes of the activation energies. The present work shows to the contrary that reversals of the flame ordering are quite possible, but that this is a subtle effect requiring attention to issues which are usually ignored in the theory of single flames. GRA

N84-28935# Air Force Academy, Colo.
NUCLEAR MAGNETIC RESONANCE STUDIES OF MOLTEN SALTS Progress Report, 1 Jan. - 31 Dec. 1983
G. F. Reynolds, J. S. Wilkes, J. A. Levisky, and A. A. Fannin, Jr. Dec. 1983 39 p
(AF Proj. 2303)
(AD-A141751; FJSRL-TR-83-0006) Avail: NTIS HC A03/MF A01 CSCL 07/4

This report describes work in the areas of the measurement and interpretation of 13C NMR chemical shifts of room temperature molten salts of various composition formed from aluminum chloride and 1-methyl-3-ethylimidazolium chloride; the measurement and interpretation of 25Al NMR lineshapes as a function of temperature and melt composition; the NMR study of the reaction of acidic AlCl3/1-methyl-3-ethylimidazolium molten salt with dissolved chlorine; and the redistribution of halide on aluminum during the mixing of acidic chloride and bromide melts in acetonitrile solvent. As part of the study of the effect of temperature on the 27Al NMR lineshapes of the molten salts, a computer program is given which uses a matrix method to simulate NMR lineshapes as a function of chemical shifts and exchange rates. Author (GRA)

N84-28936# Xerox Webster Research Center, N.Y.
CHEMICAL BONDING, INTERDIFFUSION AND ELECTRONIC STRUCTURE AT InP, GaAs, AND SI-METAL INTERFACES Interim Summary Report
L. J. Brillson 15 Jan. 1984 200 p
(Contract N00014-80-C-0778)
(AD-A141809; AD-E800931) Avail: NTIS HC A09/MF A01 CSCL 07/4

Over the past two years, we have carried out an experimental program to investigate the interface electronic states and its relation to the chemical structure formed at InP, GaAs, and Si-metal interfaces as a result of interfaces chemical reaction and diffusion. We have used soft X-ray photoemission spectroscopy to characterize interfacial bonding and diffusion on an atomic scale. We have used surface photovoltage spectroscopy to identify interface electronic states within the semiconductor band gap. We have also used Auger electron spectroscopy coupled with ion sputtering to profile the interface chemical structure after the Schottky barrier is formed and have identified spatial changes in stoichiometry normal to the interface plane which are dependent on chemical

bond strength between metal and semiconductor. These measurements provide new, more detailed relationships between the surface and interface chemical structure on a microscopic scale and the Schottky barrier formation. Author (GRA)

N84-28937# Illinois Univ., Chicago.
NITROLYSIS OF THE CN SINGLE BOND AND RELATED CHEMISTRY OF NITRO AND NITROSO GROUPS Annual Report, 1 Jan. - 31 Dec. 1983
J. H. Boyer Mar. 1984 35 p
(AD-A141825) Avail: NTIS HC A03/MF A01 CSCL 07/3

Nitric acid in acetic anhydride converted N,N-dimethylbenzylamine 1 to N-methyl-N-nitrosobenzylamine 2 (76%) and benzaldehyde. Six additional acyclic and alicyclic tertiary amines similarly gave nitrosamines; 1,4-diazabicyclo 2,2,2 octane gave an intractable mixture. An explanation for the conversions is discussed. Addition of hydrochloric acid to the reaction mixture led to recovery of the amine 1 (36%), and to its conversion (54%) to the nitrosamine 2 without the detectable formation of benzaldehyde; in contrast nitric acid (100%) and anhydrous hydrogen chloride in acetic anhydride converted the amine 1 to benzaldehyde (69%) and to the nitrosamine 2 in low yield. Nitrosamine 2 and N-methyl-N-nitroso-Beta-phenethylamine 3 were oxidized to nitramines 4 and 5. It became desirable to incorporate alpha functions into nitrosamines to provide schemes for the preparation of cage structure high energy materials. A proposed scheme is shown. GRA

N84-28938# Rochester Univ., N. Y. Dept. of Chemistry.
THEORY OF LASER-INDUCED SURFACE CHEMISTRY WITH APPLICATIONS TO MICROELECTRONICS AND HETEROGENEOUS CATALYSIS
J. T. Lin, W. C. Murphy, and T. F. George May 1984 58 p
(Contract N00014-80-C-0472)
(AD-A141832; UROCHESTER/DC/84/TR-51) Avail: NTIS HC A04/MF A01 CSCL 07/4

Theory and experiments are reviewed for how laser radiation can stimulate various component mechanisms which contribute to the complex chemistry involved in heterogeneous catalysis. These mechanisms include the processes of desorption, migration and chemical reactions at a gas-solid interface. Application of laser induced surface chemistry to microelectronics in circuit deposition, lithography, annealing and final testing of the circuit are discussed. In addition to the review, some new theory is presented. GRA

N84-28939# United Technologies Research Center, East Hartford, Conn.
INVESTIGATION OF THE KINETICS OF CATALYZED COMBUSTION OF FUEL Final Report, 1 Aug. 1980 - 29 Jan. 1984
P. J. Marteney 4 May 1984 7 p
(Contract DAAG29-80-C-0142)
(AD-A142153; UTRC/955279-1; ARO-17267.2-EG) Avail: NTIS HC A02/MF A01 CSCL 21/2

A program of fundamental studies in catalytic combustion is described. Argon-diluted mixtures of fuel and oxygen were spontaneously reacted on platinum family surfaces. The specific surface reaction rate of fuel was obtained using an analytical program treating both mass transport and chemical reaction. Observed activation energies range from 5 Kcal/mole for propylene to 20 Kcal/mole for methane. Conditions of test varied from 250 to 500 C inlet at fuel-air equivalence ratios of 0.4 to 3.0. Two-fuel mixtures were studied to determine the extent to which a more-reactive component influences the system. For mixtures of 10% propylene in methane, the reaction is essentially the same as for propylene alone, although methane under similar conditions is nearly unreactive. The condition of the surface was varied by pretreatment with fuel or oxygen. An extension in the transient time to steady operation was found, but neither suppression nor change in steady-state efficiency was seen, and the effect is entirely reversible. Interaction of NO with hydrogen reactions was observed by addition of NO to inlet mixtures. A threshold temperature of 700 C appeared to be required for reduction in excess of 50%. Author (GRA)

N84-28940# Washington State Univ., Pullman. Dept. of Physics.
C1 K-EDGE X-RAY ABSORPTION STUDIES OF CONCENTRATED FERRIC CHLORIDE SOLUTIONS
D. R. Sandstrom, E. C. Marques, and R. E. Hamm 23 May 1984 9 p
(Contract N00014-82-K-0530)
(AD-A142190; TR-1) Avail: NTIS HC A02/MF A01 CSCL 07/4

C1 K-edge X-ray absorption spectra were measured for concentrated ferric chloride solutions. A single pre-edge XANES feature due to transitions to metal 3d derived orbitals depends on concentration according to the degree of direct Fe2+ C1 bonding. Fourier transformed EXAFS spectra show well separated contributions due to FE and O backscatters. Author (GRA)

N84-28941# Washington State Univ., Pullman. Dept. of Physics.
MULTIPLE SCATTERING EFFECTS IN EXAFS (EXTENDED X-RAY ABSORPTION FINE STRUCTURE): COMPARISON BETWEEN THEORY AND EXPERIMENT FOR Pt METAL
V. A. Biebesheimer, E. C. Marques, D. R. Sandstrom, F. W. Lytle (Boeing Co., Seattle), and R. B. Greegor (Boeing Co., Seattle) 29 May 1984 32 p Submitted for publication
(Contract N00014-82-K-0530)
(AD-A142199; TR-5) Avail: NTIS HC A03/MF A01 CSCL 07/4

Extended X-ray absorption fine structure (EXAFS) model functions have been calculated for the LIII edge in Pt metal. All single, double and triple scattering contributions were taken into account, using a recently developed multiple scattering formalism. Theoretical values for the scattering amplitude, phase, and Debye-Waller factor and the universal curve for the electron mean free path have been used. Comparison to experimental data gives an estimate of the limitations in the current formalism, and shows that multiple scattering effects are important in Pt only at radial distances corresponding to fourth shell nearest neighbors. Author (GRA)

N84-28942# Washington State Univ., Pullman. Dept. of Physics.
DETERMINATION OF STRUCTURAL PARAMETERS FROM EXAFS (EXTENDED X-RAY ABSORPTION FINE STRUCTURE): APPLICATION TO SOLUTIONS AND CATALYSTS
D. R. Sandstrom 23 May 1984 44 p
(Contract N00014-82-K-0530)
(AD-A142205; TR-3) Avail: NTIS HC A03/MF A01 CSCL 07/4

A review is presented of applications of Extended X-Ray Absorption Fine Structure (EXAFS) spectroscopy to the determination of structural detail in inorganic solutions and supported metal catalyst particles. Similarities in these applications are noted and the possible role of disorder on the reliability of the EXAFS results is discussed. A brief summary of data analysis procedures is presented with examples. Author (GRA)

N84-28943# Washington State Univ., Pullman. Dept. of Physics.
STUDY OF STRONG ELECTROLYTES BY X-RAY SPECTROSCOPY AT THE c1 k-EDGE Technical Report, 1 Apr. 1982 - 31 Mar. 1983
D. R. Sandstrom 23 May 1984 8 p
(Contract N00014-82-K-0530)
(AD-A142225; TR-2) Avail: NTIS HC A02/MF A01 CSCL 07/4

Chlorine K-edge X-ray absorption spectra were measured for non-stoichiometric transition metal chloride solutions. Results confirm the degree of detail of cation-anion association available from both the XANES and EXAFS spectral regions. Author (GRA)

N84-28944# California Univ., Berkeley. Lawrence Berkeley Lab. Applied Science Div.
TRANSPORT PHENOMENA IN IMPROVED ELECTROCHEMICAL CELL DESIGN FOR THE PRODUCTION OF MAGNESIUM Final Report
D. R. Sadoway (MIT, Cambridge) Sep. 1983 46 p refs
(Contracts DE-AC03-76SF-00098; DE-AC02-81CE-90033)

(DE84-010567; LBL-17367) Avail: NTIS HC A03/MF A01

A laboratory scale electrolysis cell that is representative of industrial conditions was constructed to permit visual observation within. Experiments were conducted using an electrolyte with the composition of 10% MgCl2, 10% CaCl2, 20% KCl, 60% NaCl, at the current densities of 5.55, 27.75, and 83.25 mA/cm(2). The effects of electrolyte contamination by 0.05% boron and 0.5% sulfur were studied by repeating the electrolyses with the addition of B2O3 and MgSO4, respectively. The cathodic films deposited under these conditions were analyzed to determine how these impurities degrade cell performance. With electrolytes contaminated with either boron or sulfur, galvanostatic electrodeposition occurred at voltages too low to produce magnesium metal. Instead, what appeared to be nonmetallic deposits plated out on the cathode. These deposits consisted of magnesium compounds of the contaminants. Sodium levels high enough to be consistent with possible codeposition of sodium were detected. DOE

N84-28945# Rice Univ., Houston, Tex.
INFRARED ABSORPTION SPECTROSCOPY WITH COLOR CENTER LASERS Progress Report, 15 Feb. 1983 - 15 Mar. 1984
R. F. Curl 1984 7 p refs
(Contract DE-AS05-79ER-10477)
(DE84-006812; DOE/ER-10477/4) Avail: NTIS HC A02/MF A01

Tone burst modulation spectroscopy is investigated. Preliminary work is carried out using a LiTaO3 modulator. A new water cooled CdTe modulator with wedged ends is designed. Observations on NO are reported. Efforts are made to evaluate the use of the optogalvanic effect. DOE

N84-28946# Utah Univ., Salt Lake City.
FOURIER TRANSFORM PHOTOACOUSTIC SPECTROSCOPY Final Report, 1 Apr. 1979 - 31 Mar. 1984
E. M. Eyring Mar. 1984 19 p refs
(Contract DE-AC02-79ER-10377)
(DE84-010216; DOE/ER-10377/6) Avail: NTIS HC A02/MF A01

Technical accomplishments under this contract are reported since the inception of the contract on April 1, 1979 with somewhat greater emphasis given to work completed since the last progress report dated November, 1983. Photoacoustic spectroscopy and achievement of stated yearly objectives and long range goals. Specific recent achievements that are described include an infrared spectral study of quinoline adsorbed on a hydrodenitrogenation catalyst, a combined infrared photoacoustic-crossed polarization magic angle spinning solid state NMR investigation of several oxide bound organometallic complexes, an infrared clarification of the dependence of polyparaphenylene conjugation length on the polymer preparative method, an infrared study of the doping of this organic semiconductor with coordination compounds, a visible photothermal beam deflection spectral investigation of titanium metal corroded by a hot lubricant, and an intracavity laser photothermal beam deflection experiment. DOE

N84-28947# Dortmund Univ. (West Germany). Lehrstuhl fuer Physikalische Chemie 1.
PHYSICO-CHEMICAL STUDIES ON COPPER SULFIDE. THE CdS-Cu2S SOLAR CELL Final Report, Apr. 1983
Hans Rickert, Hans-Dieter Wiemhoefer, and Christoph Filthaut Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 74 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-065; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15,50

The use of copper sulfide in solar cells was studied. Transport properties and voltage limits for the electrochemical decomposition of copper sulfide were investigated using metal-copper sulfide-point contacts. Current-voltage behavior of metal-CuS contacts was investigated using metal-tips of gold, nickel, platinum, silver, copper, and zinc. It is found that copper deposition in CuS occurs at critical voltages up to 250 mV higher than expected from thermodynamic data. Electrical conductivities of copper sulfide were measured for compositions between Cu2.000S and Cu1.994S. Electrical conductivity, concentration and mobility of holes were determined on thin CuS-films (0.15 to 1.5 microns) with stoichiometries between Cu2.000S and Cu1.98S. Results show a chemical diffusion coefficient for Cu2.000S of 1.5 million sq cm/sec and a partial conductivity of copper-ions of 600,000/ohm/cm at 20 C. Author (ESA)

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N84-28948# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technology.
METHODS OF ANALYZING PROCESSES OF PLASTIC WORKING OF METAL, PART 1 [METODY ANALIZY PROCESOW OBROBKI PLASTYCZNEJ METALI, CZESC 1]
Marian Grzymkowski 1982 243 p refs In POLISH 4 Vol.
Copyright. Avail: Issuing Activity

The bases of the theory of plasticity are examined as they are used to analyze processes of plastic working of different metals. In these processes, the central focus is the determination of pressure per unit area, the amount of energy consumed, and the mechanism of plastic flow. From the standpoint of technical applications, the theory of plasticity is divided into construction theory (calculation of the limiting load capacity of engineering constructions) and technological theory (calculation of the stresses, deformations, and flow mechanisms of plastically formed machinery elements). Methods for solving problems of plastic flow under conditions of flat deformation, stress, and axial symmetry are considered. Author

N84-28949# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technology.
METHODS OF ANALYZING PROCESSES OF PLASTIC WORKING OF METAL, PART 3 [METODY ANALIZY PROCESOW OBROBKI PLASTYCZNEJ METALI, CZESC 3]
Marian Grzymkowski 1982 195 p In POLISH 4 Vol.
Copyright. Avail: Issuing Activity

The various technological processes of plastic formation of metal are reviewed. Planar and axial-symmetric problems posed by plastic working of metal is solved precisely by applying the method of metal characteristics or approximately by relying on estimates of upper and lower limiting load capacity. The method of simplified equations of differential equilibrium and several energy methods are among the most widely used methods for determining forces and stresses in plastic working processes. The simplified equations method is used to determine stresses and their distribution on the contact surface of a deformed metal. Energy methods for estimating strength and stresses include: a simplified method for determining pressures necessary for the deformation of a plastic material (the energy balance method); a method based on the assumption of the distribution function of the speed of plastic flow and displacement; a method based on a presumed deformation scheme; and a method based on statically allowable stress fields. Author

N84-28950# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technology.
METHODS OF ANALYZING PROCESSES OF PLASTIC WORKING OF METAL, PART 2 [METODY ANALIZY PROCESOW OBROBKI PLASTYCZNEJ METALI, CZESC 2]
Marian Grzymkowski 1982 267 p refs In POLISH 4 Vol.
Copyright. Avail: Issuing Activity

The various conditions for plasticity of metals are examined. The Huber-Mises condition of the intensity of tangent stresses is based on the assumption that the plasticity of a material is determined solely by the amount of elastic energy of a deformation, regardless of the type of stress state. The Tresca theory is referred to as the condition of maximal tangent stresses, based on the

conclusion that metals are transformed into a plastic state when maximal tangent stress attains the critical value characteristic for the given material. The theories of plastic flow of Hooke, Hencky-Iliuszin, Levy-Mises, and Prandtl-Reuss are compared. Principles of plastic deformation are discussed, including Drucker's postulate regarding the uniaxial state of stress for stable material. Principles of the limiting load capacity of engineering constructions are reviewed, and the dependence of stress on time, deformation, and temperature is analyzed. The isotropic, kinematic, and combined theories of strengthening of metal are examined. Author

N84-28951# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technology.
METHODS OF ANALYZING PROCESSES OF PLASTIC WORKING OF METAL, PART 4 [METODY ANALIZY PROCESOW OBROBKI PLASTYCZNEJ METALI, CZESC 4]
Marian Grzymkowski 1982 258 p refs In POLISH 4 Vol.
Copyright. Avail: Issuing Activity

Some specific methods of analyzing processes of plastic working of metal are described, and principles underlying the theory of plasticity are reviewed. The method of metal characteristics uses a rigid, ideal plastic model to analyze the distribution of stresses and deformations and to calculate the magnitude of stresses occurring in planar and axial-symmetric plastic working processes. The finite elements method is based on division of a sphere into a finite number of elements joined at a finite number of nodes. This method is employed in analysis of physically nonlinear problems and isotropic or anisotropic elastic-plastic material. Variation methods of analyzing processes of plastic working of metal allow calculation of unit pressure, distribution of stresses and deformations in a deformed metal, and the shape and dimensions of a body after plastic deformation. Comprehension of the foundations of the theory of plasticity as it applies to processes of plastic working of metals requires knowledge of vectors, tensors, functions, and types of matrices. Author

N84-28952# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technology.
ACOUSTIC EMISSION ACCOMPANYING PHASE CHANGE IN DEFORMED 1H18N9T STEEL [EMISJA AKUSTYCZNA TOWARZYSZACA PRZEMIANOM FAZOWYM W DEFORMOWANEJ STALI 1H18N9T]
J. Choros, S. P. Gadaj, J. Kaczmarek, W. Oliferuk, and E. Pieczyska 1982 17 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

The link between the phenomenon of acoustic emission occurring during the plastic deformation of 1H18N9T steel and phase changes taking place in the steel was investigated. The changes in magnetic permeability observed when the steel was stretched out were given special emphasis. The characteristics of the acoustic emissions were recorded and correlated with changes in magnetic permeability. When a certain amount of distortion was achieved in the steel (approximately three percent), austenite was found to be transformed into martensite. The acoustic emission signal increased as the process took place. The results showed a close correlation between the course of the measured intensity of the acoustic emission and the speed of magnetic permeability changes or the speed of phase changes. The phenomenon of acoustic emissions is important in the study of the kinetics of phase changes occurring during the plastic deformation of metals. Author

N84-28953 United Kingdom Atomic Energy Authority, Culham (England).
ANISOPTROPIC DIFFUSION KINETICS OF METALS AND CARBIDES IN PYROLYTIC GRAPHITE
W. Weisweiler and M. Alavi 28 Mar. 1984 17 p refs Transl. into ENGLISH from Ber. Deut. Keram. Ges. (West Germany), v. 53, no. 6, 1976
(BLL-CTO-2261-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

An electron beam microanalyzer was used to study the penetration of a metal (Fe, Ni, Cu) or of a carbide (Ti, V, Cr, Nb, Mo, and Hf) in pyrolytic graphite. The diffusion coefficients of nickel in pyrolytic graphite after heat treatment at 2,000 C and at various time is discussed. Tables show activation energies and time dependence. Arrhenius displays are included. A.R.H.

N84-28954 British Library Lending Div., Boston Spa (England).
ON THE STRUCTURE OF THE URANIUM-NIOBIUM-CHROMIUM-SYSTEM
G. Petzow and A. Junker 13 Mar. 1984 18 p Transl. into ENGLISH from J. of the Less-Common Metals (France), v. 5, no. 462, 1963
(BLL-Trans-1104-(7291.7965)) Avail: British Library Lending Div., Boston Spa, Engl.

The ternary systems uranium-niobium-chromium were studied from the aspect of phase constitution. The alloys were examined by means of microscopy, thermal analysis, temperature-temperature difference measurements and X-ray diffraction. The liquidus surfaces and the course of the troughs therein were determined. Isothermal sections at 1050, 850 C and four vertical sections are presented which give an idea of the shape of the phase region in terms of temperature and concentration. Five four-phase-equilibria were observed at 890, 730, 690, 633, and 613 C. Typical of this system are wide heterogeneous phase regions which in most cases contain the intermetallic NbCrs-phase. The addition of chromium does not prevent the liquation of the b.c.c. uranium-niobium solid solution at temperatures lower than 1000 C. In the case of the beta-solid solution of the binary uranium-niobium system the eutectoid decomposition temperature is shifted from 640 C to around 615 C by addition of chromium whereas for the beta1-solid solution no shift in the temperature of 60 C was observed. R.J.F.

N84-28955 British Library Lending Div., Boston Spa (England).
A MATHEMATICAL MODEL OF THE FORMATION OF POWDERED METAL COATINGS ON CASTINGS
G. Sh. Kiriya 26 Apr. 1984 7 p refs Transl. into ENGLISH from Izv. (USSR) p 80-83
(BLL-M-35598-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The process of the formation of powder metals by impregnation is discussed. A mathematical model is obtained which can be used for investigating the kinetics and duration of the formation of cast composite coatings of any type and for any purpose.
Author

N84-28956 Central Electricity Generating Board, London (England).
ABRASIVE WEAR OF STEEL DURING SLIDING OR ROLLING
O. Pigors 5 Apr. 1984 12 p refs Transl. into ENGLISH from Schmierungstech. (West Germany), v. 10, no. 9, 1979 p 270-272
(BLL-CE-Trans-8003-(9022.09)) Avail: British Library Lending Div., Boston Spa, Engl.

The parameters affecting the rolling wear behavior of steels are discussed, as well as some of the special features in comparison with sliding wear behavior. In addition to the hardness and structural state of a material of a particular chemical composition, the granular mineral with its specific properties, and also the ratio of the hardness of the steel to that of the mineral is decisive for wear mechanism. R.J.F.

N84-28957 Rolls-Royce Ltd., Derby (England).
THE USE OF JOMINY END QUENCH TO ASSESS THE HARDENABILITY OF HIGHER STRENGTH TITANIUM ALLOYS
P. J. Postans 1 Oct. 1983 13 p refs
(PNR-90169; Reprint-872) Avail: NTIS HC A02

The hardenability of commercial and experimental near alpha and alpha + beta titanium alloys was assessed using a Jominy end quench technique. The microstructures produced are related to cooling rate and alloy content, and correlation with mechanical properties is discussed. The use of this technique to select the alloy/quench rates is illustrated. Tests show that the alloys all produce a similar sequence of microstructures with decreasing quench rate. Increasing beta stabilizer content, and hence decreasing beta transus temperature, has the same effect as

increasing the quench rate in producing finer transformed beta microstructures and greater hardenability. Author (ESA)

N84-28958*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHEMICAL MECHANISMS AND REACTION RATES FOR THE INITIATION OF HOT CORROSION OF IN-738
George C. Fryburg, Fred J. Kohl, and Carl A. Stearns Jul. 1984 34 p Submitted for publication
(NASA-TP-2319; E-1847; NAS 1.60:2319) Avail: NTIS HC A03/MF A01 CSCL 11F

Sodium-sulfate-induced hot corrosion of preoxidized IN-738 was studied at 975 C with special emphasis placed on the processes occurring during the long induction period. Thermogravimetric tests were run for predetermined periods of time, and then one set of specimens was washed with water. Chemical analysis of the wash solutions yielded information about water soluble metal salts and residual sulfate. A second set of samples was cross sectioned dry and polished in a nonaqueous medium. Element distributions within the oxide scale were obtained from electron microprobe X-ray micrographs. Evolution of SO was monitored throughout the thermogravimetric tests. Kinetic rate studies were performed for several pertinent processes; appropriate rate constants were obtained from the following chemical reactions: Cr2O3 + 2 Na2SO4(1) + 3/2 O2 yields 2 Na2CrO4(1) + 2 SO3(g)n TiO2 + Na2SO4(1) yields Na2O(TiO2)n + SO3(g)n TiO2 + Na2CrO4(1) yields Na2O(TiO2)n + CrO3(g). Author

N84-28959# Bureau of Mines, Washington, D. C. Div. of Nonferrous Metals.
LEAD
William D. Woodbury and John A. Rathjen 1983 20 p refs
Avail: NTIS HC A02/MF A01

Lead is an important strategic and critical metal because of the dependency of both military and civilian activities on the stored energy provided by lead acid batteries. In terms of tonnage used, lead ranks only after aluminum, copper, and zinc among the nonferrous metals. Its major uses are in storage batteries, as an antiknock additive in gasoline, and in materials for the construction and metalworking industries. Other uses include ammunition, protective coatings and paints, radiation shielding, and electrical cable sheathing. The strategic uses of lead were reviewed, and metallurgical technologies relating to lead were assessed. Lead reserves in the United States and in the world and supply-demand relationships were overviewed. Economic factors and problems and the impact of EPA and OSHA standards on lead use and the lead industry were discussed. R.S.F.

N84-28960*# Southwest Research Inst., San Antonio, Tex.
DEVELOPMENT OF CARBON SLURRY FUELS FOR TRANSPORTATION (HYBRID FUELS, PHASE 2)
T. W. Ryan, III and L. G. Dodge May 1984 174 p refs
(Contracts DEN3-263; DE-AI01-81CS-50006)
(NASA-CR-174659; DOE/NASA/0263-1; NAS 1.26:174659; SwRI-6948) Avail: NTIS HC A08/MF A01 CSCL 11F

Slurry fuels of various forms of solids in diesel fuel are developed and evaluated for their relative potential as fuel for diesel engines. Thirteen test fuels with different solids concentrations are formulated using eight different materials. A variety of properties are examined including ash content, sulfur content, particle size distribution, and rheological properties. Attempts are made to determine the effects of these variations on these fuel properties on injection, atomization, and combustion processes. The slurries are also tested in a single cylinder CLR engine in both direct injection and prechamber configurations. The data includes the normal performance parameters as well as heat release rates and emissions. The slurries perform very much like the baseline fuel. The combustion data indicate that a large fraction (90 percent or more) of the solids are burning in the engine. It appears that the prechamber engine configuration is more tolerant of the slurries than the direct injection configuration. M.A.C.

N84-28961*# IIT Research Inst., Chicago, Ill.
CREEP-RUPTURE BEHAVIOR OF CANDIDATE STIRLING ENGINE IRON SUPPERALLOYS IN HIGH-PRESSURE HYDROGEN. VOLUME 2: HYDROGEN CREEP-RUPTURE BEHAVIOR Final Report
S. Bhattacharyya, W. Peterman, and C. Hales Jun. 1984 105 p refs
(Contracts DEN3-303; DE-AI01-77CS-51040)
(NASA-CR-174705; NAS 1.26:174705; IITRI-M06116-15) Avail: NTIS HC A06/MF A01 CSCL 11F

The creep rupture behavior of nine iron base and one cobalt base candidate Stirling engine alloys is evaluated. Rupture life, minimum creep rate, and time to 1% strain data are analyzed. The 3500 h rupture life stress and stress to obtain 1% strain in 3500 h are also estimated. M.A.C.

N84-28962*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OXIDATION AND CORROSION RESISTANCE OF CANDIDATE STIRLING ENGINE HEATER-HEAD-TUBE ALLOYS
Joseph R. Stephens and Charles Barrett May 1984 33 p refs
(Contract DE-AI01-77CS-51040)
(NASA-TM-83609; DOE/NASA/51040-53; E-2028; NAS 1.15:83609) Avail: NTIS HC A03/MF A01 CSCL 11F

Sixteen candidate iron base Stirling engine heater head tube alloys are evaluated in a diesel fuel fired simulator materials test rig to determine their oxidation and corrosion resistance. Sheet specimens are tested at 820 C for 3500 hr in 5 hr heating cycles. Specific weight change data and an attack parameter are used to categorize the alloys into four groups; 10 alloys show excellent for good oxidation and corrosion resistance and six alloys exhibit poor or catastrophic resistance. Metallographic, X-ray, and electron microprobe analyses aid in further characterizing the oxidation and corrosion behavior of the alloys. Alloy compositions, expecially the reactive elements aluminum, titanium, and chromium, play a major role in the excellent oxidation and corrosion behavior of the alloys. The best oxidation resistance is associated with the formation of an iron nickel aluminum outer oxide scale, an intermediate oxide scale rich in chromium and titanium, and an aluminum outer oxide scale adjacent to the metallic substrate, which exhibits a zone of internal oxidation of aluminum and to some extent titanium. M.A.C.

N84-28963*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCED HIGH TEMPERATURE MATERIALS FOR THE ENERGY EFFICIENT AUTOMOTIVE STIRLING ENGINE
Robert H. Titran and Joseph R. Stephens 1984 22 p refs Presented at Conf. on Mater. for Future Energy Systems, Washington, D.C., 1-3 May 1984; sponsored by American Society for Metals
(Contract DE-AI01-77CS-51040)
(NASA-TM-83659; E-2056; NAS 1.15:83659) Avail: NTIS HC A02/MF A01 CSCL 11F

The Stirling Engine is under investigated jointly by the Department of Energy and NASA Lewis as an alternative to the internal combustion engine for automotive applications. The Stirling Engine is an external combustion engine that offers the advantage of high fuel economy, low emissions, low noise, and low vibrations compared to current internal combustion automotive engines. The most critical component from a materials viewpoint is the heater head consisting of the cylinders, heating tubes, and regenerator housing. Materials requirements for the heater head include compatibility with hydrogen, resistance to hydrogen permeation, high temperature oxidation/corrosion resistance and high temperature creep-rupture and fatigue properties. A continuing supporting materials research and technology program has identified the wrought alloys CG-27 and 12RN72 and the cast alloys XF-818 and NASAUT 4G-A1 as candidate replacements for the cobalt containing alloys used in current prototype engines. Based on the materials research program in support of the automotive Stirling engine it is concluded that manufacture of the engine is feasible from low cost iron-base alloys rather than the cobalt alloys rather

than the cobalt alloys used in prototype engines. This paper will present results of research that led to this conclusion. Author

N84-28964*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FASTENER LOAD TESTS AND RETENTION SYSTEMS TESTS FOR CRYOGENIC WIND-TUNNEL MODELS
John W. Wallace Aug. 1984 46 p refs
(NASA-TM-85805; L-15751; NAS 1.15:85805) Avail: NTIS HC A03/MF A01 CSCL 11F

A-286 stainless steel screws were tested to determine the tensile load capability and failure mode of various screw sizes and types at both cryogenic and room temperature. Additionally, five fastener retention systems were tested by using A-286 screws with specimens made from the primary metallic alloys that are currently used for cryogenic models. The locking system effectiveness was examined by simple no-load cycling to cryogenic temperatures (-275 F) as well as by dynamic and static loading at cryogenic temperatures. In general, most systems were found to be effective retention devices. There are some differences between the various devices with respect to ease of application, cleanup, and reuse. Results of tests at -275 F imply that the cold temperatures act to improve screw retention. The improved retention is probably the result of differential thermal contraction and/or increased friction (thread-binding effects). The data provided are useful in selecting screw sizes, types, and locking devices for model systems to be tested in cryogenic wind tunnels. Author

N84-28965*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EROSION OF IRON-CHROMIUM ALLOYS BY GLASS PARTICLES
Joshua Salik and Donald H. Buckley Jul. 1984 10 p refs
(NASA-TP-2354; E-1615; NAS 1.60:2354) Avail: NTIS HC A02/MF A01 CSCL 11F

The material loss upon erosion was measured for several iron-chromium alloys. Two types of erodent material were used: spherical glass beads and sharp particles of crushed glass. For erosion with glass beads the erosion resistance (defined as the reciprocal of material loss rate) was linearly dependent on hardness. This is in accordance with the erosion behavior of pure metals, but contrary to the erosion behavior of alloys of constant composition that were subjected to different heat treatments. For erosion with crushed glass, however, no correlation existed between hardness and erosion resistance. Instead, the erosion resistance depended on alloy composition rather than on hardness and increased with the chromium content of the alloy. The difference in erosion behavior for the two types of erodent particles suggested that two different material removal mechanisms were involved. This was confirmed by SEM micrographs of the eroded surfaces, which showed that for erosion with glass beads the mechanism of material removal was deformation-induced flaking of surface layers, or peening, whereas for erosion with crushed glass it was cutting or chopping. Author

N84-28966# Virginia Univ., Charlottesville.
THE USE OF NOVEL PROCESSING PROCEDURES FOR IMPROVING THE OVERALL FATIGUE RESISTANCE OF HIGH STRENGTH ALUMINUM ALLOYS Annual Scientific Report, 1 Jan. - 31 Dec. 1983
E. A. Starke, Jr. Feb. 1984 38 p
(Grant AF-AFOSR-0061-83; AF Proj. 2306)
(AD-A141107; UVA/525638/MS84/101; AFOSR-84-0357TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

Its objective is to develop an understanding of the mechanisms involved in the initiation and propagation of fatigue cracks in metals in order to optimize the microstructure of high strength aluminum alloys for overall fatigue resistance. The research conducted during this year was divided into three tasks. Task 1 was concerned with the effects of slip character and grain size on the intrinsic material and extrinsic closure contributions to fatigue crack growth resistance of 7475. Special thermal mechanical processing procedures were developed to control the microstructural features of interest. Task 2 was concerned with the use of the cyclic stress strain curve and a damage model for predicting fatigue crack growth thresholds. Fatigue crack initiation and fatigue crack propagation both involve the concept of cyclic accumulated damage. The details of the damage structure can be related to a material's cyclic stress strain response (CSSR). Task 3 is concerned with the effect of ion implantation on the low cycle fatigue response of 7475. Since fatigue crack initiation is a surface phenomenon and fatigue crack propagation is a bulk phenomenon, the fatigue properties may be optimized by production processes that develop microstructures resistant to FCI on the surface, and microstructures resistant to FCP throughout the bulk. GRA

N84-28967# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
FAILURE BY CREEP CRACKING AND CREEP FATIGUE INTERACTION IN NICKEL BASE SUPERALLOYS Final Technical Report
R. Raj Jan. 1984 45 p
(Grant AF-AFOSR-0008-80)
(AD-A141112; AFOSR-84-0339TR) Avail: NTIS HC A03/MF A01 CSCL 11/6

The objective of this investigation was to study the mechanisms of failure under conditions of creep-fatigue interaction, and creep-crack-growth. The approach was to identify the mechanisms and then develop models for describing failure in terms of the loading variables and the microstructure. In the following sections, the results from each topic are summarized. Further details of the work are available in publications. Author (GRA)

N84-28968# Pittsburgh Univ., Pa. Dept. of Metallurgical and Materials Engineering.
INTERACTIONS BETWEEN EROSION AND CORROSION OF METALS AND ALLOYS AT ELEVATED TEMPERATURES Final Report, 5 Jan. 1981 - 4 Jan. 1984
N. Birks and F. S. Pettit Apr. 1984 36 p
(Contract DAAG29-81-K-0027)
(AD-A141410; ARO-17421.1-MS) Avail: NTIS HC A03/MF A01 CSCL 11/6

Structural alloys and coating alloys have been developed that successfully resist high temperature oxidation and, to a lesser extent, hot corrosion-depending on conditions. Such protection depends upon the maintenance of a surface layer of oxide that effectively separates the metal from the reactive environment. The oxide protective coatings may however be damaged by erosion by solid particles in the gas flow, the effect being worse when the velocity of the gas flow is high. Unfortunately the detailed mechanisms by which the processes of erosion and oxidation interact at high temperatures are not understood. Much of the work carried out so far has involved studies of the erosion of metals and oxidized metals at room temperature under controlled conditions, or has involved tests at high temperature under conditions designed to simulate those in gas turbines or coal combustors. The data obtained from such tests are well suited to producing reliable comparisons of the behavior of different materials but do not readily lead to analysis of the mechanisms by which erosion and corrosion interact at high temperature. The work described in this report was designed to provide data obtained under well characterized conditions such that understanding could be gained concerning the interaction of erosion and corrosion at high temperatures. Author (GRA)

N84-28969# Case Western Reserve Univ., Cleveland, Ohio.
COLD WORKING AND ANNEALING EFFECTS ON THE CREEP AND RUPTURE RESISTANCE OF THE OXIDE-DISPERSION-STRENGTHENED ALLOY MA754
L. J. Ebert, M. L. Telich, M. Holly, and B. Roopchand Warren, Mich. Army Tank-Automotive Command Research and Development Center Nov. 1983 133 p
(Contract DAAE07-82-C-4017; DA Proj. 1L1-62601-AH-91)
(AD-A141438; TACOM-TR-12896) Avail: NTIS HC A07/MF A01 CSCL 11/6

The mechanisms of the deformation and annealing response

of MA754 were examined through a study of the interrelationships between cold work and thermal treatments as they affect various material performance parameters at elevated temperatures. Various cold rolling plus annealing experiments indicate that the recrystallization of MA754 is controlled by primary recrystallization principles. It has been found that, through the application of a stepwise cold rolling plus annealing schedule, total reductions of at least 40% (reduction in thickness) at ambient temperature can be obtained while at the same time maintaining a grain morphology favorable for good high temperature properties. High temperature (0.94 T sub m) annealing treatments given to stabilize the grain structure following cold work produce a change in both the size and distribution of the dispersoid phase. Measurements reveal that the average particle size increases as (time), typical of diffusion-controlled Ostwald ripening. The coarsening observed in the process material is restricted to the grain boundaries, and results in a significant loss in creep resistance. GRA

N84-28970# Illinois Univ., Urbana. Urbana Dept. of Metallurgy and Mining Engineering.

MECHANICAL PROPERTIES OF METAL HYDRIDES

H. K. Birnbaum Apr. 1984 23 p

(Contract N00014-83-K-0468)

(AD-A141496) Avail: NTIS HC A02/MF A01 CSCL 11/6

The role of metal hydrides in the hydrogen embrittlement of a number of metal-hydrogen systems is reviewed. The stress induced formation and cleavage of hydrides at crack tips and the thermodynamics of the hydrides in the stress field of the crack tip are discussed. The mechanical response of the hydrides to applied stresses is described. Many of the hydrides exhibit some plastic deformation under favorable stress systems with the amount of this deformation increasing as the temperature of testing is increased. Phonon properties and the elastic moduli of the hydrides are briefly discussed and it is suggested that these parameters do not provide a basis for understanding the mechanical properties of the hybrides. The deformation response of the hydrides is consistent with the expected behavior of dislocations in the ordered hydride structures. Author (GRA)

N84-28971# North Carolina Univ., Raleigh. Dept. of Materials Engineering.

THE ELECTROPLASTIC EFFECT IN METALS

H. Conrad, A. F. Sprecher, and S. L. Mannan 11 May 1984 14 p

(Contract DAAG29-81-K-0075)

(AD-A141526; ARO-18184.5-MS) Avail: NTIS HC A02/MF A01 CSCL 11/6

The influence of electric current on the mechanical properties of metals is reviewed. Included are the effects of both low density approx. 1A/sq mm continuous current and high density approx. (1000A/sq mm) current pulses, with special attention given to the latter. The influence of the parameters involved in the thermally-activated overcoming of short-range obstacles to dislocation motion. Considered are: (1) the force drift electrons exert on dislocations held up at obstacles and (2) the influence of drift electrons on the obstacle strength and on the pre-exponential factor. Author (GRA)

N84-28972# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

CAUSES AND PREVENTION OF STRUCTURAL MATERIALS FAILURES IN NAVAL ENVIRONMENTS Progress Report

V. S. Agarwala, D. A. Berman, and G. Kohlhaas 1984 37 p

(AD-A141560; NADC-84039-60) Avail: NTIS HC A03/MF A01 CSCL 11/6

An analysis is made of most corrosion related naval aircraft structural materials failure problems. The phenomena of stress corrosion cracking, hydrogen or environmental cracking, corrosion fatigue and exfoliation corrosion are discussed. Methods of determining hydrogen embrittling effects and hydrogen concentration are described and related to sustained load tolerances of cadmium plated high strength steels. An electro-mechanical test is described to illustrate the hydrogen-induced elastic deformation effect in steels. This test procedure has been also used to calculate the hydrogen diffusion coefficient as well as the hydrogen concentration. A technique which can monitor corrosivity of the naval environment aboard ship has been reported. Metallurgical methods of mitigating corrosion such as heat treatment and alloy development are described. Mechanistic aspects of corrosion-assisted mechanical failures (cracking) are analyzed and a multidisciplinary approach to solve the problem is described. It is demonstrated that modifications of the crack-tip chemistry can effectively lead to inhibition of corrosion fatigue and stress corrosion cracking in high strength alloys. Author (GRA)

N84-28973# Ohio State Univ., Columbus. Dept. of Welding Engineering.

DEVELOPMENT OF LOW COST FILLER MATERIALS FOR WELDING HIGH STRENGTH STEELS Final Report, 1 Sep. 1981 - 31 Dec. 1983

R. A. Bell, D. E. Clark, and D. G. Howden 29 Apr. 1984 112 p

(Contract N00014-81-K-0788)

(AD-A141724) Avail: NTIS HC A06/MF A01 CSCL 11/6

HY130 is a quenched and tempered steel designed for high strength and good toughness in the as-welded condition. The welding consumables, however, are fairly expensive and the available sources limited. A study was conducted to determine the feasibility of synthesizing the desired composition in the weld pool using the Shielded Metal Arc (SMAW), Gas Metal Arc (GMAW), and Submerged Arc (SAW) welding processes. This was accomplished by feeding two commercially available materials into the weld pool in appropriate proportions. In the SMAW and SAW deposits adequate mixing of the two materials was achieved. Some inhomogeneities were observed in the GMAW deep penetration finger. This slight lack of mixing could be improved through further process development. Weldments produced with all three processes met the yield strength and elongation requirements for 140 filler materials. Dynamic tear tests conducted on submerged arc weldments came close to meeting the requirements while weldments produced with the other processes were somewhat lower. This was thought to be due to higher than allowed residual element levels and could be improved through optimization of starting material compositions. The techniques developed in this program have shown potential for obtaining weld metals of specific compositions for high strength steels at reduced cost. Author (GRA)

N84-28974# Drexel Univ., Philadelphia, Pa. Dept. of Materials Engineering.

A FUNDAMENTAL STUDY OF P/M PROCESSED ELEVATED TEMPERATURE ALUMINUM ALLOYS Annual Technical Report, 1 Oct. 1982 - 30 Sep. 1983

A. Lawley and M. J. Koczak Mar. 1984 23 p

(Grant AF-AFOSR-0010-82; AF Proj. 2306)

(AD-A141780; AFOSR-84-0433TR) Avail: NTIS HC A02/MF A01 CSCL 11/6

Powder processed Al-Fe-Ni alloys containing (FeNi)Al9 dispersoids in the range 0.2-0.3 volume fraction are being examined with respect to processing mode, microstructure, microstructural stability and elevated temperature tensile and creep response. The overall objective is to establish a comprehensive and quantitative fundamental understanding of processing-microstructure relations in this new class of alloys in order to provide design guidelines with respect to service stresses and temperatures. To date, microstructural characterization, dispersoid stability, hot tensile and creep resistance have been characterized. These data and observations confirm the benefits of rapid solidification, promising levels of structural stability, and potential for long-time service at temperatures up to approx. 250 C (482 F). Using the L-S-W theory, it is possible to predict coarsening kinetics over a wide range of temperatures. GRA

N84-28975# Rensselaer Polytechnic Inst., Troy, N. Y.

EFFECT OF REFRACTORY ELEMENTS ON THE COHERENCY STRAIN AND FLOW STRESS ON NICKEL-BASE SUPERALLOYS

M. Naik and G. S. Ansell Jun. 1984 17 p
(Contract N00014-76-C-0458)
(AD-A142220; TR-16) Avail: NTIS HC A02/MF A01 CSCL 11/6

Various refractory elements from groups IVB, VB and VIB are used in nickel-base superalloys to increase their mechanical strength and service life at high temperatures. Group IVB and VB metals partition primarily to gamma, dilate the gamma structure and increase its antiphase boundary energy. Group VIB metals partition primarily to the gamma matrix and dilate the gamma lattice and decrease its stacking fault energy. The alteration of the lattice parameters of gamma and gamma by these elements changes the effective coherency strain. Molybdenum and tungsten also reduce the solubility of aluminum in the matrix, whereas titanium reduces the solubility of molybdenum in the gamma precipitate. These interactions affect the resulting volume fraction of gamma and the gamma - gamma mismatch. Deformation in high coherency alloys proceeds by dislocation particle bypass through Orowan bowing, whereas in low coherency alloys, deformation requires dislocation-particle shear (APB shear, S/ISF-S/ESF shear). The flow stress in Ni-15Cr-Ti-Al-Mo alloys is shown to be mainly a function of coherency strain at all temperatures. GRA

N84-28976# Department of the Navy, Washington, D. C.
CHEMICAL VAPOR DEPOSITION AND REACTIVE DIFFUSION OF BORON ON BERYLLIUM Patent Application
D. K. Das and K. Kumar, inventors (to Navy) Filed 27 Dec. 1983 14 p
(AD-D011043; US-Patent-Appl-SN-566080) Avail: NTIS HC A02/MF A01 CSCL 13/8

This abstract discloses a method for depositing boron on a beryllium substrate by using chemical vapor deposition. The method involves treating the surface of a heated beryllium substrate with a mixture of argon and diborane. The substrate is rotated during the chemical vapor deposition for the formation of beryllium boride layer of uniform thickness. The CVD gas mixture is adjusted for improved bonding of the beryllium boride to the substrate and thus improved wear resistance and reduced friction characteristics of the beryllium substrate. GRA

N84-28977# Argonne National Lab., Ill. Chemical Technology Div.
METAL DISSOLUTION KINETICS IN HALIDE MELTS
J. L. Settle and Z. Nagy 1984 11 p refs Presented at the Spring Meeting of the Electrochem. Soc., Cincinnati, 6-11 May 1984
(Contract W-31-109-eng-38)
(DE84-004030; CONF-840555-1) Avail: NTIS HC A02/MF A01

Although the kinetics and mechanism of the anodic dissolution of metals is an important aspect of corrosion studies, few such measurements have been carried out in high-temperature molten salts, mainly because of experimental difficulties caused by the high temperature and the high rate of the reactions. In this work the dissolution kinetics of nickel, iron, and molybdenum has been investigated in several halide melts. These melts were the eutectic mixtures of LiCl-KCl, LiCl-RbCl-CaCl2, LiBr-KBr-CsBR, and NaCl-NaAlCl4, containing 10 to the minus 7 power to 10 to the minus 4 power mol/cu cm chloride of the metal under investigation. The measurements were carried out in the temperature range of 175 to 550 C. The measurement techniques used were D.C. relaxation techniques, mainly double pulse galvanostatic, but also single pulse galvanostatic, and coulostatic techniques. The results of these measurements will be presented, compared to previously reported exchange current densities, and discussed in the light of the applicability limitations of each measurement technique for fast reactions. DOE

N84-28978# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Engineering.
TRANSPORT PHENOMENA IN IMPROVED ELECTROCHEMICAL CELL DESIGN FOR THE PRODUCTION OF MAGNESIUM Final Report
Donald R. Sadoway 1 Sep. 1983 44 p refs
(Contract DE-AC02-81CE-90033)
(DE84-006436; DOE/CE-90033/6) Avail: NTIS HC A03/MF A01

A laboratory scale electrolysis cell representative of industrial conditions is constructed to permit visual observation. Experiments are conducted using an electrolyte with the composition of 10% MgCl2, 10% CaCl2, 20% KCl, 60% NaCl, at the current densities of 5.55, 27.75, and 83.25 mA/cm(2). The effects of electrolyte contamination of 0.05% boron and 0.5% sulfur are studied by repeating the electrolyses with the addition of B2O3 and MgSO4, respectively. The cathodic films deposited under these conditions are analyzed to determine how these impurities degrade cell performance. With electrolytes contaminated with either boron or sulfur, galvanostatic electrodeposition occurs at voltages too low to produce magnesium metal. Deposits plate out on the cathode. These deposits consist of magnesium compounds of the contaminants. Sodium levels high enough to be consistent with possible codeposition of sodium are detected. DOE

N84-28979# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
MECHANISMS OF MICROSTRUCTURALLY-INFLUENCED FATIGUE CRACK GROWTH IN DUAL-PHASE STEELS M.S. Thesis
V. B. Dutta Jun. 1983 67 p refs
(Contract DE-AC03-76SF-00098)
(DE84-008491; LBL-16261) Avail: NTIS HC A04/MF A01

Mechanistic implications associated with resistance to fatigue crack growth in three different microstructures of dual-phase Fe/2Si/0.1C steel have been examined. The tests have been conducted at both near-threshold (less than or equal to 10 to the minus 6 power mm/cycle) and high (approx. 10 to the minus 6 power to 10 to the minus 4 power mm/cycle) growth rates as well as at low and high load ratios. The above tests have been accompanied by fatigue crack closure measurements at different stress intensities, (DELTA)K. Both fine globular and coarse dual-phase structures demonstrate exceptionally high resistance to crack growth at near-threshold and mid-growth regions - perhaps the highest ever observed in steels. The crack growth resistance has been observed to be closely related to fracture surface roughness and crack closure levels. The implications of such observations have been discussed in terms of four mutually competitive mechanisms, namely, roughness induced closure, roughness + plasticity induced closure, crack deflection and intrinsic microstructural characteristics. DOE

N84-28980# Northwestern Univ., Evanston, Ill.
MICROSTRUCTURAL EVALUATION OF A FERRITIC STAINLESS STEEL BY SMALL ANGLE NEUTRON SCATTERING
S. Kim, J. R. Weertman, S. Spooner (ORNL, Tenn.), C. J. Glinka (NBS, Washington, D.C.), V. Sikka (ORNL, Tenn.), and W. B. Jones (Sandia Labs, Albuquerque, N. Mex.) 1983 9 p refs Presented at the TMS-AIME Fall Meeting, Philadelphia, 2 Oct. 1983
(Contracts DE-AC04-76DP-00789; DE-AC02-81ER-10960; Grant NSF DMR-82-16972)
(DE84-009487; SAND-84-0055C; CONF-8310205-9) Avail: NTIS HC A02/MF A01

The material studied is Fe9Cr1Mo modified by the addition of small amounts of V and Nb. The major changes detected by the neutrons are alterations in size, number and composition of the carbides. SANS measurements of samples aged 5000 h at various temperatures showed that aging at 538(0)C produces a maximum in the scattering cross section. Aging at this temperature also maximizes hardness. Size distributions of the carbides derived from inversion of the SANS data show that 538(0)C results in the largest number of small carbides. Higher aging temperatures lead to appreciable carbide coarsening. SANS measurements of samples deformed at 649(0)C showed that microstructural changes can be detected after only a few hours of fatigue. High voltage electron microscopy studies have shown that the major microstructural changes produced by high temperature exposure are carbide coarsening, subgrain development, and a drastic decrease in dislocation density. DOE

N84-28981# Illinois Univ., Urbana. Dept. of Physics.
NUCLEAR MAGNETIC RESONANCE STUDY OF THE STRUCTURE OF SIMPLE MOLECULES ADSORBED ON METAL SURFACES: ACETYLENE ON PLATINUM Ph.D. Thesis
Po-Kang Wang 1984 93 p refs Sponsored in part by an Exxon Foundation Fellowship
(Contract DE-AC02-76ER-01198)
(DE84-008661; DOE/ER-01198/1406) Avail: NTIS HC A05/MF A01

Nuclear Magnetic Resonance is used to determine the structure of acetylene (HC - CH) adsorbed at room temperature on small platinum particles by studying the (13)C-(13)C, (13)C-(1)H, and (1)H-(1)H dipolar interactions among the nuclei in the adsorbed molecules. A model of 77% CCH2 and 23% HCCH is consistent with the data. The C-C bond length of the majority species, CCH2, is determined as 1.44 + or - 0.02 A, midway between a single and double bond, suggesting that both carbon atoms bond to the surface. DOE

N84-28982# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
APPLICATION OF HVEM IN PHASE TRANSFORMATION RESEARCH
K. H. Westmacott and U. Dahmen Feb. 1984 19 p refs Presented at the Seminar on Phase Stability and Phase Transformations, Bombay, 6-8 Feb. 1984
(Contract DE-AC03-76SF-00098)
(DE84-009226; LBL-17370; CONF-840274-1) Avail: NTIS HC A02/MF A01

In a high voltage electron microscope, relatively thick sections can be penetrated with the consequences that in hot stage experiments the foil surfaces are no longer the dominant sink for solute atoms and point defects. This allows dynamic changes in microstructure, representative of bulk materials, to be studied in-situ. In this paper, several examples are given that illustrate the utility of this procedure in studies of precipitation reactions and other phase transitions. The technique has been particularly useful in correlating the nucleation or growth of a new phase with changes in the lattice defect structure. In several instances, credible nucleation and growth mechanisms have been deduced from the observations. Additional information on the effects of point defect supersaturations and the stability of precipitate structures in a radiation environment, is also readily obtained by operating the microscope above the threshold voltage for atomic displacements. DOE

N84-28983# Vacuumschmelze G.m.b.H., Hanau (West Germany). Entwicklungsabteilung.
AMORPHOUS METALS WITH HIGH MAGNETIC PERMEABILITY Final Report, Dec. 1982
Rainer Hilzinger and Walter Kunz Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 112 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-056; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23,50

Magnetic and physical properties of FeNi- and Co-based amorphous alloys were studied as a function of alloy composition and annealing conditions. Relaxation processes of magnetic anisotropies and magnetostriction were investigated in order to improve the aging behavior of the magnetic properties. Optimum magnetic values are obtained with 8 % boron and 11 % silicon addition for proportional shares of Fe and Ni. Magnetic loss for magnetostrictive alloys is 150 to 200 mW/g. Author (ESA)

N84-28984# Technische Univ., Berlin (West Germany). Inst. fuer Nichtmetallische Werkstoffe.
STRUCTURE AND MECHANICAL PROPERTIES IN THE Al2O3-MgO SYSTEM [GEFUEGE UND MECHANISCHE EIGENSCHAFTEN IM SYSTEM AL2O3-MGO]
P. Stringl and H. Hausner 1983 14 p In GERMAN Presented at DKG-Jahrestagung, Bad Nauheim, West Germany, 10-12 Oct. 1983
Avail: NTIS HC A02/MF A01

Microstructure influence on the mechanical properties of extremely pure aluminum oxides is studied together with the effect of increasing magnesium oxide doping (30 to 100,000 ppm) on structural development. The additive amounts allow single-phase and two phase structures. Cross section results show that the fracture strength depends strongly upon the porosity, while the grain size has no influence for undoped and doped aluminum up to 0.25% MgO. For MgO amounts of 2.5% to 5% the fracture toughness increases with increased grain size. Increased addition of magnesium oxide in the range 30 to 10,000 ppm has no influence on the mechanical properties; by additive amounts (> 3%) MGO the fracture strength increases while the strength decreases. Author (ESA)

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N84-28985 Research Inst. of National Defence, Stockholm (Sweden).
PLASTIC ROTATING BANDS, OBTURATORS AND SABOTS
Anders Wirsen Mar. 1984 84 p refs In SWEDISH; ENGLISH summary
(FOA-C-20534-D2; ISSN-0347-3694) Avail: NTIS HC A05

Plastic rotating bands were developed for low caliber (20 to 40 mm) projectiles in rapid fire systems. Materials included nylon with glass fiber reinforcement; polyacetals, polyethene, polyethersulphone, polycarbonate, and teflon. On higher caliber projectiles (100 to 150 mm) a metallic rotating band is provided with a plastic obturating ring. Self eliminating sabots and sliding bands were developed in plastic materials. Band design, choice of band material and manufacture are discussed. Author (ESA)

N84-28986*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEPOSITION OF DIAMONDLIKE CARBON FILMS Patent Application
M. J. Mirtich, J. S. Sovey, and B. A. Banks, inventors (to NASA) Filed 9 Jul. 1984 10 p
(NASA-Case-LEW-14080-1; US-Patent-Appl-SN-628866) Avail: NTIS HC A02/MF A01 CSCL 11G

A diamondlike carbon film is deposited in the surface of a substrate by exposing the surface to an argon ion beam containing a hydrocarbon. The current density in the ion beam is low during initial deposition of the film. Subsequent to this initial low current condition, the ion beam is increased to full power. At the same time a second argon ion beam is directed toward the surface of the substrate. The second ion beam has an energy level much greater than that of the ion beam containing the hydrocarbon. This addition of energy to the system increases mobility of the condensing atoms and serves to remove lesser bound atoms. NASA

N84-28987*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SULFONE-ESTER POLYMERS CONTAINING PENDENT ETHYNYL GROUPS Patent Application
Paul M. Hergenrother and Brian J. Jensen, inventors (to NASA) Filed 23 May 1984 19 p
(NASA-Case-LAR-13316-1; US-Patent-Appl-SN-613139) Avail: NTIS HC A02/MF A01 CSCL 11B

Sulfone ester polymers containing pendent ethynyl groups and a direct and multistep process for their preparation are disclosed. The process involves the conversion of a pendent bromo group to the ethynyl group while the direct route involves reacting hydroxy-terminated sulfone oligomer or polymers with a stoichiometric amount of 5(4-ethynyl phenoxy)isophthaloyl chloride. The

5(4-ethynyl phenoxy)isophthaloyl chloride synthesis procedures are also disclosed. NASA

N84-28988*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ETHYNYL-TERMINATED ESTER OLOGOMERS AND POLYMERS THEREFROM Patent Applications
Paul M. Hergenrother and Stephen J. Havens, inventors (to NASA) Filed 23 May 1984 18 p
(NASA-Case-LAR-13118-1; US-Patent-Appl-SN-613138) Avail: NTIS HC A02/MF A01 CSCL 11B

A class of ethynyl terminated oligomers and the process for preparing same are disclosed. Upon the application of heat, with or without a catalyst, the ethynyl groups react to provide cross-linking and chain extension to increase the polymer use temperature and improve the polymer solvent resistance. These polyesters are potentially useful in packaging, magnetic tapes, capacitors, industrial belting, protective coatings, structural adhesives and composite matrices. NASA

N84-28989*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SECONDARY ELECTRON EMISSION CHARACTERISTICS OF ION-TEXTURED COPPER AND HIGH-PURITY ISOTROPIC GRAPHITE SURFACES
Arthur N. Curren and Kenneth A. Jensen Jul. 1984 16 p refs
(NASA-TP-2342; E-2064; NAS 1.60:2342) Avail: NTIS HC A02/MF A01 CSCL 11G

Experimentally determined values of true secondary electron emission and relative values of reflected primary electron yield for untreated and ion textured oxygen free high conductivity copper and untreated and ion textured high purity isotropic graphite surfaces are presented for a range of primary electron beam energies and beam impingement angles. This investigation was conducted to provide information that would improve the efficiency of multistage depressed collectors (MDC's) for microwave amplifier traveling wave tubes in space communications and aircraft applications. For high efficiency, MDC electrode surfaces must have low secondary electron emission characteristics. Although copper is a commonly used material for MDC electrodes, it exhibits relatively high levels of secondary electron emission if its surface is not treated for emission control. Recent studies demonstrated that high purity isotropic graphite is a promising material for MDC electrodes, particularly with ion textured surfaces. The materials were tested at primary electron beam energies of 200 to 2000 eV and at direct (0 deg) to near grazing (85 deg) beam impingement angles. True secondary electron emission and relative reflected primary electron yield characteristics of the ion textured surfaces were compared with each other and with those of untreated surfaces of the same materials. Both the untreated and ion textured graphite surfaces and the ion treated copper surface exhibited sharply reduced secondary electron emission characteristics relative to those of untreated copper. The ion treated graphite surface yielded the lowest emission levels. Author

N84-28990*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OXYGEN DIFFUSION IN ALPHA-Al2O3 Ph.D. Thesis
James D. Cawley, John W. Halloran (Case Western Reserve Univ.), and Alfred R. Cooper (Case Western Reserve Univ.) Jun. 1984 356 p refs
(Grant NsG-3291)
(NASA-TM-83622; E-1862; NAS 1.15:83622) Avail: NTIS HC A16/MF A01 CSCL 11G

Oxygen self diffusion coefficients were determined in single crystal alpha-Al2O3 using the gas exchange technique. The samples were semi-infinite slabs cut from five different boules with varying background impurities. The diffusion direction was parallel to the c-axis. The tracer profiles were determined by two techniques, single spectrum proton activation and secondary ion mass spectrometry. The SIMS proved to be a more useful tool. The determined diffusion coefficients, which were insensitive to impurity levels and oxygen partial pressure, could be described by D = .00151 exp (-572kJ/RT) sq m/s. The insensitivities are discussed in terms of point defect clustering. Two independent models are consistent with the findings, the first considers the clusters as immobile point defect traps which buffer changes in the defect chemistry. The second considers clusters to be mobile and oxygen diffusion to be intrinsic behavior, the mechanism for oxygen transport involving neutral clusters of Schottky quintuplets. Author

N84-28991*# National Aeronautics and Space Administration, Washington, D. C.
ORGANIC MATERIALS FOR CERAMIC MOLDING PROCESSES
Katsuyoshi Saito May 1984 28 p refs Transl. into ENGLISH from "Seramikkusu Seikeiyo no Yuki Zairo" Japan, Seramikkusu, v. 18, no. 2, 1983 p 93-102 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77438; NAS 1.15:77438) Avail: NTIS HC A03/MF A01 CSCL 11B

Ceramic molding processes are examined. Binders, wetting agents, lubricants, plasticizers, surface active agents, dispersants, etc., for pressing, rubber pressing, sip casting, injection casting, taping, extrusion, etc., are described, together with forming machines. M.A.C.

N84-28992*# National Aeronautics and Space Administration, Washington, D. C.
PRESSURE FILTRATION OF CERAMIC PASTES. 4: TREATMENT OF EXPERIMENTAL DATA
Aurora Seco Torrecillas, Jose Ferrer Polo, and Antonio Aucejo Perez May 1984 13 p refs Transl. into ENGLISH from Bol. Soc. Espan. de Ceram. y Vidrio (Spain), v. 21, no. 4/5, 1982 p 251-254 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77454; NAS 1.15:77454) Avail: NTIS HC A01/MF A01 CSCL 11B

The use of data processing method based on the algorithm proposed by Kalman and its application to the filtration process at constant pressure are described, as well as the advantages of this method. This technique is compared to the least squares method. The operation allows the precise parameter adjustment of the equation in direct relationship to the specific resistance of the cake. M.A.C.

N84-28993*# Missouri Univ., Rolla. Dept. of Ceramics Engineering.
MEA/A-1 EXPERIMENT 81F01 CONDUCTED ON STS-7 FLIGHT, JUNE 1983. CONTAINERLESS PROCESSING OF GLASS FORMING MELTS Final Report
D. E. Day and C. S. Ray 10 Apr. 1983 48 p refs
(Contract NAS8-34758)
(NASA-CR-171048; NAS 1.26:171048) Avail: NTIS HC A03/MF A01 CSCL 11B

The space processing of containerless, glassforming melts on board the space shuttle flight STS-7 is investigated. Objectives include; (1) obtain quantitative evidence for the supression of heterogeneous nucleation/crystallization, (2) study melt homogenization without gravity driven convection, (3) procedural development for bubble free, high purity homogeneous melts inmicro-g, (4) comparative analysis of melts on Earth and in micro g, and (5) assess the apparatus for processing multicomponent, glass forming melts in a low gravity environment. M.A.C.

N84-28994*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROPERTIES OF FERRITES IMPORTANT TO THEIR FRICTION AND WEAR BEHAVIOR
Kazuhisa Miyoshi and Donald H. Buckley [1983] 29 p refs Prepared for presentation at the Joint Lubrication Conf., San Diego, Calif., 22-24 Oct. 1984; sponsored by ASME and Am. Soc. of Lubrication Engr.
(NASA-TM-83718; E-2002; NAS 1.15:83718) Avail: NTIS

HC A03/MF A01 CSCL 11G

Environmental, chemical and crystallographical effects on the fundamental nature on friction and wear of the ferrites in contact with metals, magnetic tapes and themselves are reviewed. The removal of adsorbed films from the surfaces of ferrites results in very strong interfacial adhesion and high friction in ferrite to metal and ferrite to magnetic tape contacts. The metal ferrite bond at the interface is primarily a chemical bond between the metal atoms and the large oxygen anions in the ferrite surface, and the strength of these bonds is related to the oxygen to metal bond strength in the metal oxide. The more active the metal, the higher is the coefficient of friction. Not only under adhesive conditions, but also under abrasive conditions the friction and wear properties of ferrites are related to the crystallographic orientation. With ferrite to ferrite contact the mating of highest atomic density (most closely packed) direction on matched crystallographic planes, that is, <110> directions on /110/planes, results in the lowest coefficient of friction. Author

N84-28995*# TRW, Inc., Redondo Beach, Calif. Energy Development Group.

IMPROVED HIGH TEMPERATURE RESISTANT MATRIX RESINS

G. E. Chang, S. H. Powell, and R. J. Jones Aug. 1983 71 p refs

(Contract NAS3-23274)

(NASA-CR-168210; NAS 1.26:168210; Rept-38945-6012-UT-00) Avail: NTIS HC A04/MF A01 CSCL 11D

The objective was to develop organic matrix resins suitable for service at temperatures up to 644 K (700 F) and at air pressures up to 0.4 MPa (60 psia) for time durations of a minimum of 100 hours. Matrix resins capable of withstanding these extreme oxidative environmental conditions would lead to increased use of polymer matrix composites in aircraft engines and provide significant weight and cost savings. Six linear condensation, aromatic/heterocyclic polymers containing fluorinated and/or diphenyl linkages were synthesized. The thermo-oxidative stability of the resins was determined at 644 K and compressed air pressures up to 0.4 MPa. Two formulations, both containing perfluoroisopropylidene linkages in the polymer backbone structure, exhibited potential for 644 K service to meet the program objectives. Two other formulations could not be fabricated into compression molded zero defect specimens. Author

N84-28996# Raylo Chemicals Ltd., Edmonton (Alberta).

LOW COST ACETYLENE TERMINATED POLYMERS Final Report, 27 Sep. 1982 - 30 Sep. 1983

J. F. Prescott, S. P. Lee, and R. Ippolito Wright-Patterson AFB, Ohio AFWAL Feb. 1984 45 p

(Contract F33615-82-C-5051; AF Proj. 2303)

(AD-A140040; AFWAL-TR-83-4159) Avail: NTIS HC A03/MF A01 CSCL 07/3

A three step procedure for the synthesis of acetylene terminated polymers was studied. The meta- and para- ATB systems, made from Bis Phenol A, were used to develop a process which would be amenable to large scale production. Several changes in the work-up of the reactions were made to reduce the use of carcinogenic solvents and to eliminate costly and unwieldy chromatography columns. The use of toluene as a solvent permitted efficient removal of palladium and copper at significantly lower cost. Products and major by-products in the three steps were characterized by analytical techniques including HPLC and NMR. Author (GRA)

N84-28997# Kentucky Univ., Lexington.

STUDIES ON B-(PYRAZOL-1'-yl)PYRAZABOLES Report, 1983 - 1984

K. Niedenzu and P. M. Niedenzu 24 Apr. 1984 24 p

(Contract N00014-83-K-0611)

(AD-A141115; UK/DC/TR-1) Avail: NTIS HC A02/MF A01 CSCL 07/2

The pyrazaboles H2B(mu-pz)2BRR' (pz = pyrazolyl = N2C-3H3; R = R' = H; R = H, R' = pz; R = R'= pz) have been prepared by reaction of poly(pyrazol-l-yl)-borate ions with (CH3) 3NBH2I. Also the preparation of the pyrazoboles Hpz'B(mu-pz') 2BHpz' and pz'2B(mu-pz')2Bpz'2B(pz' = N2C3H-3,5-(CH3)2) is reported. The latter compound forms a thermally very stable and unusual monohydrate. Studies on the interaction of H2B(mu-pz) 2BH2 with Hpz' suggest that, in contrast to electrophilic substitutions, the condensation to yield B-pyrazolylpyrazaboles occurs via opening of the initial central B2N4 ring of the pyrazabole. Author (GRA)

N84-28998# Dayton Univ., Ohio.

EFFECTS OF SURFACE FLAWS ON IMPACT RESISTANCE OF UNCOATED POLYCARBONATE Interim Technical Report, Jun. - Jul. 1981

M. P. Bouchard Wright-Patterson AFB, Ohio AFWAL Mar. 1984 23 p

(Contract F33615-80-C-3401; AF Proj. 1926)

(AD-A141364; UDR-TR-82-74; AFWAL-TR-84-3016) Avail: NTIS HC A02/MF A01 CSCL 11/9

Uncoated aircraft transparency polycarbonate is highly susceptible to surface abrasions. This report describes an experimental effort of limited scope to determine the effects of flaws on the resistance of polycarbonate to the impulsed, high energy loading conditions of bird impact. Test fixturing for flaw formation and high rate load application to polycarbonate beam specimens is described. It is demonstrated that polycarbonate is sensitive to changes in scratch profile and is less sensitive to changes in scratch depth. Net absorbed energy decreases with increasing scratch depth. However, scratches of any depth produce fracture if the scratch has a sharp, V-shaped profile. Author (GRA)

N84-28999# Rutgers - The State Univ., Piscataway, N. J. High Pressure Materials Research Lab.

PRESSURE-DEPENDENCE OF GLASS TRANSITION TEMPERATURE OF ELASTOMERIC GLASSES Interim Report

K. D. Pae, C. L. Tang, and E. S. Shin 1 May 1984 34 p

(Contract N00014-82-K-0608)

(AD-A141485; TR-3) Avail: NTIS HC A03/MF A01 CSCL 11/9

Pressure dependence of the glass transition temperature (T sub g) of two elastomers, Solithane 113 and 3,3-Bis(azidomethyl) oxetane/tetrahydrofuran (BAMO/THF) has been determined, employing high pressure differential thermal analysis (HP-DTA) and dielectric techniques, up to 8.5 Kbar. The glasses of the elastomers were named the speoific (or P sub i - glass) or the general glass depending on how the glasses were formed. A P sub i - glass was formed by lowering temperature under a constant pressure (P sub i) and the pressure dependency of the P sub i - glass was determined after changing pressure only in the glassy state. The general glass consists of a series of specific glasses but the T sub g is determined only at pressure under which the glass is formed. The T sub g for both glasses appears to level off at very high pressures while the T sub g does not level off for the general glass. Thermodynamic analysis was made to show that for many general glasses including Solithane, n = 1 in dT sub g/dp = alpha delta/(1 + n) delta alpha. It is also shown that variation in several parameters in the Gibbs and DiMarzio theory can be used effectively to predict the observed experimental results. Author (GRA)

N84-29000# National Materials Advisory Board, Washington, D.C.

HIGH-PERFORMANCE, LOW-ENERGY-CURING RESINS Final Report

Mar. 1984 56 p

(Contract MDA903-82-C-0434)

(AD-A141524; NMAB-412) Avail: NTIS HC A04/MF A01 CSCL 11/9

Resin systems that are curable at reasonable rates at ambient temperature, or at slightly elevated temperatures, are needed for temporary repair of composite structures on damaged airframes. However, efforts to date have not been successful in yielding properties useful at temperatures higher than the cure temperature. The committee reviewed the state of the art and

recommended a number of approaches for supported research. These include preordered reactions, acrylate esters, reactive solvents, waveguide curing, epoxy resins, secondary ring closing reactions, donor-acceptor complexes, and the use of fillers, in conjunction with these approaches. Author (GRA)

N84-29001# Naval Research Lab., Washington, D. C.
POLY(ETHYLENE MALEATE) - CYCLOPENTADIENE: A MODEL REACTIVE POLYMER-VAPOR SYSTEM FOR EVALUATION OF A SAW (SURFACE ACOUSTIC WAVE) MICROSENSOR Progress Report, Oct. 1982 - Oct. 1983
A. Snow and H. Wohltjen 23 Apr. 1984 31 p
(AD-A141531; AD-E000566; NRL-MR-5313) Avail: NTIS HC A03/MF A01 CSCL 14/2

A model reactive polymer vapor system based on the Diels Alder reaction has been used to verify the behavior of a surface acoustic wave (SAW) device chemical microsensor. Poly(ethylene maleate) (PEM) was synthesized and characterized both spectroscopically and thermally for use as a selective receptor of cyclopentadiene vapor. The formation of a non-reversible Diels Alder adduct between a PEM coating on a SAW delay line oscillator and the cyclopentadiene results in a film mass change which is easily measured by the SAW device. Physical absorption of nonreacting solvent vapors can be distinguished from the cyclopentadiene interaction. The resulting cyclopentadiene dosimeter is capable of detecting 200 ppm of vapor in 1 minute. Significantly lower detection limits are possible if longer vapor integration periods are allowed. GRA

N84-29002# Union Carbide Corp., Tarrytown, N.Y.
ORGANOSILANE POLYMERS. 5: HYDROSILYL-MODIFIED POLYCARBOSILANE PRECURSORS FOR SILICON CARBIDE
C. L. Schilling, Jr. and T. C. Williams Sep. 1983 14 p
(Contract N00014-81-C-0682)
(AD-A141546; TR-83-1) Avail: NTIS HC A02/MF A01 CSCL 07/3

The use of MeSiHCl2 as a comonomer in the preparation of polycarbosilanes has provided materials with improved pyrolytic yields of silicon carbide ceramic compositions. These polymers, prepared by potassium metal dechlorination of mixtures of chlorosilane monomers in tetrahydrofuran, incorporate MeSiHCl2 both as trifunctional MeSi(3-) units and as difunctional -MeSiH- units. Author (GRA)

N84-29003# Union Carbide Corp., Tarrytown, N.Y.
ORGANOSILANE POLYMERS. 6: BRANCHED POLYSILAHYDROCARBON PRECURSORS FOR SILICON CARBIDE
C. L. Schilling, Jr. and T. C. Williams Sep. 1983 15 p
(Contract N00014-81-C-0682)
(AD-A141558; TR-83-2) Avail: NTIS HC A02/MF A01 CSCL 07/3

Polysilahydrocarbon precursors for silicon carbide ceramic compositions have been prepared by potassium dechlorination reactions of mixtures of chlorosilanes and hydrocarbon olefins such as styrene or isoprene. The presence of branched silyl units in the polymer backbones is critical in providing significant ceramic yields. Author (GRA)

N84-29004# Union Carbide Corp., Tarrytown, N.Y.
ORGANOSILANE POLYMERS, 8 Final Report, 1 May 1975 - 30 Jul. 1983
C. L. Schilling, Jr. and T. C. Williams Sep. 1983 9 p
(Contracts N00014-75-C-1024; N00014-81-C-0682)
(AD-A141627; TR-83-4) Avail: NTIS HC A02/MF A01 CSCL 07/3

Preparation, properties, and conclusions regarding organosilane polymers and their conversion to silicon carbide ceramics during the contract period are summarized. The polymers include high molecular weight polydimethylsilanes, alkyl-modified, soluble polydimethylsilanes, polysilane block copolymers, polysilahydrocarbons, and vinylic polysilanes. Author (GRA)

N84-29005# Army Natick Research and Development Command, Mass.
MICROBIAL EVALUATION OF SOME ADHESIVE FORMULATIONS AND ADHESIVE BASES Interim Technical Report, Oct. 1982 - Sep. 1983
B. J. Wiley, J. Polishook, J. Stevens, D. L. Kaplan, and A. M. Kaplan Dec. 1983 23 p
(DA Proj. 1L1-62723-AH-98)
(AD-A141659; NATICK/TR-84/023) Avail: NTIS HC A02/MF A01 CSCL 11/1

A number of commercial adhesive formulations and adhesive bases were evaluated for microbial susceptibility or resistance. Many of these adhesives and bases were found to be susceptible either due to attack on the adhesive base itself or on other components in the formulations. Work will continue on the evaluation of thermoplastic and thermosetting resins and also plasticizers used in adhesive formulations. The incorporation of biocides in some of these formulations may be the most viable approach to prevent deterioration of adhesives and the resultant loss of functionality of the material or system of which it is an integral part. Author (GRA)

N84-29006# Alabama Univ., University.
SYNTHESIS AND EVALUATION OF IMPROVED ELECTRON-BEAM AND X-RAY LITHOGRAPHIC RESIST POLYMERS Final Report, 1 Jul. 1979 - 31 Dec. 1981
C. U. Pittman, Jr. May 1984 9 p
(Contract DAAG29-79-C-0128)
(AD-A141674; ARO-16201.9-CH) Avail: NTIS HC A02/MF A01 CSCL 11/9

It was the goal of this research to investigate the relationship between the chemical structure of polymers and the properties which would result in a new generation of lithographic resists for electron-beam and X-ray lithography. Thus, the synthesis of a variety of vinyl homopolymers, copolymers and terpolymers was undertaken where quaternary centers were present along the polymer backbone. Author (GRA)

N84-29007# Southwest Research Inst., San Antonio, Tex.
EFFECTS OF MICRONIC FILTRATION ON TURBINE ENGINE LUBRICANT DEPOSITION Final Report, 15 Aug. 1980 - 15 Aug. 1983
J. C. Tyler, J. P. Cuellar, Jr., and R. L. Mason Wrght-Patterson AFB, Ohio AFWAL Oct. 1983 71 p
(Contract F33615-80-C-2034; AF Proj. 3048)
(AD-A141802; SWRI-6191; AFWAL-TR-83-2065) Avail: NTIS HC A04/MF A01 CSCL 11/8

The effects of micronic filtration on deposit forming characteristics of turbine engine lubricants were investigated, employing a hot-wall deposition test rig. The test-oil sump of the rig was modified with a wear-metal generator and for filtration tests, a filter housing was installed in the test lubricant pressure line. Without filtration, 15 micron filtration and 3 micron filtration test were performed. Ten MIL-L-7808 or MIL-L-7808 type lubricants were evaluated under six different test conditions. Accordingly, a special test method was used to study the effect of micronic filtration on deposition of the lubricants both with mild steel wear generation and without wear generation. Also, the effects on both kinematic viscosity and neutralization number of the test lubricants were determined and are presented. A direct calculation of wear-metal generation was provided by weight-loss measurements of the mild steel wear coupons mounted below the lubricant level in the sump. Also, the concentration of iron in samples of the test lubricants taken during testing was determined by energy dispersive X-ray fluorescence and these results are presented and discussed. A statistical analysis of the three response variables, namely deposit rating, viscosity increase and neutralization number change, by analysis of covariance was performed. GRA

N84-29008# Southwest Research Inst., San Antonio, Tex.
EFFECTS OF WEAR METAL ON LUBRICANT DEPOSITION Final Report, 1 Sep. 1981 - 1 Sep. 1983
J. C. Tyler, J. P. Cuellar, Jr., and R. L. Mason Wright-Patterson

AFB, Ohio AFWAL Nov. 1983 99 p
(Contract F33615-81-C-2021)
(AD-A142027; SWRI-6721; AFWAL-TR-83-2078) Avail: NTIS HC A05/MF A01 CSCL 11/8

The effects of wear metal on deposit forming characteristics of turbine engine lubricants were investigated, employing hot-wall deposition test rigs. The hot-wall section of the rigs was redesigned, fabricated and assembled for testing. A recently designed wear-metal generator was employed. Eight MIL-L-7808 or MIL-L-7808-type lubricants were evaluated under five different test conditions. Then a brief statistical analysis was performed to determine the micronic filtration tests to be performed in a mitigation of wear-metal effects phase of the effort. Also, the effects on both kinematic viscosity and neutralization number of the test lubricants were determined. A direct calculation of wear-metal generation was provided by weight-loss measurements of the wear coupons mounted below the lubricant level in the sump. Also, the concentration of wear metals in samples of the test lubricants taken during testing was determined by atomic absorption spectrophotometer. The energy dispersive X-ray fluorescence technique was employed to determine trace elements in hot-wall deposit scrapings. The preliminary statistical analysis for all eight lubricants consisted of a one-way analysis of variance, then an analysis of covariance using an adjustment for wear, and finally an unadjusted analysis of variance. GRA

N84-29009# California Univ., Santa Barbara. Dept. of Physics.
PROGRAM FOR RESEARCH ON CONDUCTING POLYMERS Progress Report, 1 May 1983 - 30 Apr. 1984
A. J. Heeger and F. Wudl 30 Apr. 1984 12 p
(Contract N00014-83-K-0450)
(AD-A142148) Avail: NTIS HC A02/MF A01 CSCL 20/3

This research program consists of a parallel effort directed toward the synthesis of conjugated polymers and the characterization of these polymers through a broad base of physical measurements. The approach involves step-by-step synthesis of new polymer systems using specific synthetic techniques; i.e. the design and synthesis of new conducting polymers. This involves close interaction between chemists and physicists and a constant back-and-forth interplay to characterize new materials and stimulate ideas on new systems. Continuing studies of the chemistry and physics of known conducting polymers is a critical part of the program, since future progress is limited by an in-depth understanding of successful known systems. Recent efforts in the latter area focused on the polyheterocycle, poly(thiophene). GRA

N84-29010# Massachusetts Inst. of Tech., Cambridge. Center for Materials Science and Engineering.
ELECTRICAL MONITORING OF POLYMERIZATION REACTIONS WITH THE CHARGE-FLOW TRANSISTOR Final Report, Jul. 1978 - May 1984
S. D. Senturia 31 May 1984 10 p
(Contract N00014-78-C-0591)
(AD-A142267) Avail: NTIS HC A02/MF A01 CSCL 11/9

The primary goal of this program was to develop a promising new technique for the electrical monitoring of polymerizations based on a device called the charge-flow transistor, and its related device, the floating-gate charge-flow transistor. The program was directed toward the development of the instrumentation capabilities of the device and toward the research use of the method for the study of selected polymer systems. GRA

N84-29011# Department of the Navy, Washington, D. C.
FLUORINATED POLYURETHANES Patent Application
T. M. Keller, inventor (to Navy) Filed 20 Apr. 1984 18 p
(AD-D011066; US-Patent-Appl-SN-602256) Avail: NTIS HC A02/MF A01 CSCL 07/3

This invention relates in general to low surface energy fluoropolymers and more specifically to fluorinated polyurethanes which are the condensation products of fluorinated tertiary polyfunctional alcohols and aliphatic diisocyanates. Perfluorinated polymers have long been employed as low surface energy coatings and materials. These polymers, despite their relatively high costs, have found uses in O-rings, gaskets, diaphragms, fuel tank sealants, and coatings. The high cost of these polymers, however, has limited the use of these polymers to relatively expensive items. A low surface energy polymer which is not highly fluorinated would eliminate much of this expense. Novel polymers and prepolymers are formed by reacting a fluorinated tertiary polyfunctional alcohol with an aliphatic diisocyanate or a biuret derivative of said diisocyanate in the presence of a suitable catalyst and in the absence of solvent. The novel polymers and prepolymers exhibit low surface energy properties and may be used in non-fouling coatings, foams and elastomers. GRA

N84-29012# Department of the Navy, Washington, D. C.
NOVEL ANTISTATIC PACKAGING MATERIALS Patent Application
M. K. Bernett, D. C. Weber, and H. Ravner, inventors (to Navy) Filed 21 Sep. 1983 34 p
(AD-D011069; US-Patent-Appl-SN-534477) Avail: NTIS HC A03/MF A01 CSCL 13/4

This disclosure relates generally to antistatic packaging materials and more specifically to antistatic materials incorporating an electroactive polymer. The objects of the invention are achieved by the use of a fluorine ion (fluoronium ion, F+) implanted polymer as a packaging material. F+ ions are implanted into a polymer to give the polymer a surface resistivity of no greater than about 10 to the 12th power ohms/sq. The substrate is packaged so that any static charge upon the substrate transfers to the F+ implanted polymer, which forms at least part of a conductive pathway allowing the static charge to dissipate into the environment. GRA

N84-29013# Minnesota Mining and Mfg. Co., St. Paul. Optics Technology Center.
POLYMERIC WEB LENS EVALUATION
Sanford Cobb, Jr. Feb. 1984 34 p
(Contract DE-AC04-76DP-00789)
(DE84-010108; SAND-83-7023) Avail: NTIS HC A03/MF A01

The feasibility of producing parquets of point focus fresnel leases on a continuous thin polymeric web is described. The parquet produced consists of 15 square lenses, each 6.7 in. on a side. Two 15 lens parquets are laminated to a heavier acrylic sheet for rigidity. The primary aim is the production of the parquet in thin form, with performance approaching that of compression molded lenses. A high degree of replication is possible, with performance nearly equal to the direct out contol lens. DOE

N84-29014# Mound Lab., Miamisburg, Ohio.
DETERMINATION OF THE OPTIMUM CRYSTALLIZATION CONDITIONS OF A HIGH THERMAL EXPANSION GLASS-CERAMIC
W. Ross Henderson, Daniel P. Kramer, and Don B. Sullenger 7 Mar. 1984 11 p
(Contract DE-AC04-76DP-00053)
(DE84-009734; MLM-3136) Avail: NTIS HC A02/MF A01

Quench studies are performed to determine the crystalline phases present at different times and temperatures in the crystallization cycle of a glass ceramic. This information is used in production operations to optimize the thermal expansion characteristics between the glass ceramic and various superalloys. DOE

N84-29015# Schott Glaswerke, Mainz (West Germany). Zentralbereich Forschung und Entwicklung.
DEVELOPMENT OF FINE-STRUCTURED COMPONENTS FOR GAS DISCHARGE DISPLAYS Final Report, Dec. 1982
Hans Duerolf Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 76 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-031; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16

Fine structured components of glass ceramics or glass for use in flat displays are considered. A melting and processing

technology of raw glass was worked and for the production of corrosive and crystallization sensitive special glass and a pilot production for UV radiation, thermal treatment and etching was set up. Cell sheets of photoetching glass with a hole density of 800/sqcm and a thickness of 1 mm are obtained. The maximum specimen sizes are 304 mm x 216 mm and 286 mm x 234 mm for use in 14 in flat display laboratory specimens. Author (ESA)

N84-29016# Imhausen-Chemie G.m.b.H., Lahr (West Germany).
FUNDAMENTAL RESEARCH FOR PRODUCTION OF HIGH POLYMERS ON SYNTHESIS GAS BASIS Final Report, Dec. 1982
Siegbert Roesch, Eugen Lang, and Wolfgang Tomek Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 84 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-075; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16,50

Conversion of carbon monoxide and hydrogen into macromolecular paraffinic hydrocarbons (polymethylene) using ruthenium catalysts under high pressure is described. Two high pressure (3.5 kbar) autoclaves were used for testing the catalysts. Gas circulation was used for stirring the catalyst suspension. Increased metal specific polymethylene yield by a factor of 10 is obtained by the use of suitable supporting materials and improvement of reduction conditions. Results show that with the help of catalyst supports it is possible to gain high polymers with good yield direct from synthesis gas. Author (ESA)

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N84-29017*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
LIQUID HYDROGEN POLYGENERATION SYSTEM AND PROCESS Patent Application
Peter A. Minderman, Gary P. Gutkowski, Lawrence Manfredi, Julian V. King, and Frank S. Howard, inventors (to NASA) Filed 24 Apr. 1984 23 p
(NASA-Case-KSC-11304-1; US-Patent-Appl-SN-603373) Avail: NTIS HC A02/MF A01 CSCL 21I

An integrated polygeneration system and process is disclosed for generating liquid hydrogen as a main energy product for use as a propellant for space vehicles. The integrated process includes a coal gasification and gas cleanup system, a combined cycle power generation system, a hydrogen production and liquefaction system and a air separation system. Secondary energy products and commodities for supporting a space center complex and launching of the space vehicle includes the production of electrical and thermal energy and gaseous nitrogen. NASA

N84-29018*# Rocketdyne, Canoga Park, Calif.
METHANE HEAT TRANSFER INVESTIGATION Bimonthly Technical Progress Report, 14 Apr. - 14 Jun. 1984
14 Jun. 1984 48 p refs
(Contract NAS8-34977)
(NASA-CR-171051; NAS 1.26:171051; ASR84-45; BMPR-8) Avail: NTIS HC A03/MF A01 CSCL 21I

Future high chamber pressure LOX/hydrocarbon booster engines require copper base alloy main combustion chamber coolant channels similar to the SSME to provide adequate cooling and reusable engine life. Therefore, it is of vital importance to evaluate the heat transfer characteristics and coking thresholds for LNG (94% methane) cooling, with a copper base alloy material adjacent to he fuel coolant. High pressure methane cooling and coking characteristics recently evaluated at Rocketdyne using stainless steel heated tubes at methane bulk temperatures and coolant wall temperatures typical of advanced engine operation except at lower heat fluxes as limited by the tube material. As expected, there was no coking observed. However, coking evaluations need be conducted with a copper base surface exposed to the methane coolant at higher heat fluxes approaching those of future high chamber pressure engines. Author

N84-29019# Monsanto Research Corp., Dayton, Ohio.
PROPERTIES OF AIRCRAFT FUELS AND RELATED MATERIALS Interim Report, 15 Feb. 1982 - 15 Jul. 1983
F. Neil Hodgson, R. G. Gable, and Charlotte D. Fritsch Mar. 1984 215 p
(Contract F33615-81-C-2035; AF Proj. 3048)
(AD-A141068; AFWAL-TR-84-2022) Avail: NTIS HC A10/MF A01 CSCL 21/4

Fuel tests, analyses, and analytical method development were conducted on a number of fuels of an experimental nature in conjunction with ongoing Air Force programs for studying fuel combustion behavior, turbine engine design, and other fuel related technologies. Fuels from conventional and alternate sources were studied, as were fuels of the high density missile propellant type. A wide variety of both physical and chemical properties of the fuels were measured and are tabulated. Studies conducted to aid in the solution of operational problems are also reported. Author (GRA)

N84-29020# Ogden Air Logistics Center, Hill AFB, Utah. Propellant Analysis Lab.
STAGE I PROPELLANT SURVEILLANCE REPORT GLACIAL ACRYLIC ACID MOTORS GAA-001 AND GAA-002 TP-HIOII Final Report
J. A. Thompson Apr. 1984 51 p
(AD-A141099; MANPA-497(84)) Avail: NTIS HC A04/MF A01 CSCL 21/9

Thiokol Minuteman First Stage propellant used acrylic acid to produce the HB polymer used as the binder. The original supplier of acrylic acid stopped production and Thiokol then obtained acrylic acid produced by the Taft, Louisiana Plant of Union Carbide Co. To assure that this new source of supply was a satisfactory replacement, Thiokol ran qualification testing on the new material (See TWR-4716, May 1972 - ADB-894 033L.) and found it satisfactory. In the Thiokol program two motors were cast in 1971 and propellant from the mixes were cast into cartons for a ten year test program. This propellant was then transferred to this laboratory and testing on a yearly basis was started in 1975. Due to insufficient propellant, the full ten year program was not possible. Testing was completed after nine years and this is the final report. From an analysis of the data the propellant's physical properties are satisfactory and the stability, with respect to age, is satisfactory. GRA

N84-29021# Naval Surface Weapons Center, White Oak, Md.
SYNTHESIS OF ENERGETIC MATERIALS Annual Progress Report
H. G. Adolph, M. Chaykovsky, J. M. Goldwasser, and W. M. Koppes 31 Mar. 1984 40 p
(AD-A141495) Avail: NTIS HC A03/MF A01 CSCL 07/3

The work described in this report, consisted of two separate tasks which will be discussed in turn: (1) synthesis of energetic monomers and polymers, and (2) synthesis of polycyclic and adamantoid nitramines. Both tasks were continuations of previous work, and pre-1983 results. The principal objectives of the work are the synthesis of energetic (nitro) polymers with improved energy and physical properties, specifically polyformals derived from nitro substituted diols, and the synthesis of nitramines with high crystal density and energy-density greater than HMX. GRA

N84-29022# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
ORDER OF FUNCTIONING Final Report
18 May 1984 9 p Supersedes MTP-4-1-003, AD-718657

(AD-A141851; TOP-4-1-003; MTP-4-1-003) Avail: NTIS HC A02/MF A01 CSCL 19/4

This background document provides information for determining the order of functioning of explosive charges and types of functioning (detonation or deflagration). Detonation is high-order functioning, and deflagration is low-order functioning. It also provides analysis on explosives functioning in the air, on land, after penetrating armor plate and within weapon tubes. GRA

N84-29023# National Bureau of Standards, Washington, D.C. Molecular Spectroscopy Div.

FREE RADICAL DETECTION AND DYNAMICS IN PROPELLANT IGNITION AND COMBUSTION SYSTEMS Final Report, 1 Apr. 1981 - 31 Mar. 1984

Marilyn E. Jacox and John C. Stephenson 21 May 1984 18 p (Contract MIPR-113-84)

(AD-A142180; ARO-17710.8-CH) Avail: NTIS HC A02/MF A01 CSCL 19/1

In order to obtain a detailed characterization of the chemistry and energetics of the processes which constitute the first stages of the decomposition of the model propellants nitromethane and methyl nitrite, three types of experiment were pursued. In the first series of studies, infrared spectra were obtained for the products of the ultraviolet photodissociation of these two compounds isolated in solid argon at 14 K. Infrared spectra were also obtained for the products of H-atom abstraction from nitromethane and methyl nitrite, including the first spectroscopic observation of the nitromethyl free radical. A summary of the information obtained regarding the chemical reaction mechanism for the first stages of the decomposition of nitromethane and methyl nitrite is presented. In the second series of experiments, the characteristics of a CO2 laser with a uniquely will defined radiation pulse were tested and this laser was used together with laser-induced fluorescence detection to obtain the energy distribution in the resulting NO when methyl nitrite was dissociated. A marked preference for one spin-orbit state of the NO was observed. The third series of experiments was concerned with the infrared multiphoton dissociation of a pulsed beam of methyl nitrate or nitromethane coupled with matrix isolation sampling and infrared study of the resulting decomposition products. GRA

N84-29024# Mound Lab., Miamisburg, Ohio.

BATCH AND CONTINUOUS RECRYSTALLIZATION OF SECONDARY EXPLOSIVES

W. J. Moodie and J. E. Bennett 9 Mar. 1984 31 p refs (Contract DE-AC04-76DP-00053)

(DE84-009735; MLM-3137) Avail: NTIS HC A03/MF A01

Explosive powders are recrystallized for use in development and production programs of the US Department of Energy. Batch and continuous precipitation units are operated on a small scale to produce powders of different crystal morphology over a wide range of specific surface areas. The equipment and procedures are described for both methods of operation. Safety aspects, and features designed to optimize product purity and freedom from contamination are discussed. Experimental studies are conducted to determine the effects of varying the process parameters. The results are used to select the operating conditions to make powders for specific applications. DOE

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N84-29025*# National Aeronautics and Space Administration, Washington, D. C.

GRINDING KINETICS AND EQUILIBRIUM STATES

Ludmilla Opoczky and Ferenc Farnady Mar. 1984 19 p refs Transl. into ENGLISH from "AZ Orles Kinetikaja es Egyensuli Allapotok" Budapest, Epitoanyag, v. 34, no. 12, 1982 p 441-442 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep by Central Research and Planning Inst. of the Silicate Industry, Budapest

(Contract NASw-3541)

(NASA-TM-77430; NAS 1.15:77430) Avail: NTIS HC A02/MF A01 CSCL 13H

The temporary and permanent equilibrium occurring during the initial stage of cement grinding does not indicate the end of comminution, but rather an increased energy consumption during grinding. The constant dynamic equilibrium occurs after a long grinding period indicating the end of comminution for a given particle size. Grinding equilibrium curves can be constructed to show the stages of comminution and agglomeration for certain particle sizes. Author

N84-29026# Air Force Human Resources Lab., Brooks AFB, Tex.

SAFETY TRAINING PRIORITIES Final Report

N. A. Thompson and H. W. Ruck Apr. 1984 43 p

(AF Proj. 7719; AF Proj. 2313)

(AD-A141711; AFHRL-TR-83-57) Avail: NTIS HC A03/MF A01 CSCL 05/9

The Air Force is interested in identifying potentially hazardous tasks and prevention of accidents. This effort proposes four methods for determining safety training priorities for job tasks in three enlisted specialties. These methods can be used to design training aimed at avoiding loss of people, time, materials, and money associated with on-the-job accidents. Job tasks performed by airmen were measured using task and job factor ratings. Combining accident reports and job inventories, subject-matter experts identified tasks associated with accidents over a 3-year period. Applying correlational, multiple regression, and cost-benefit analysis, four methods were developed for ordering hazardous tasks to determine safety training priorities. GRA

N84-29027# Department of the Navy, Washington, D. C.

FURNACE TRANSIENT ANNEAL PROCESS AND APPARATUS Patent Application

D. A. Collins, D. L. Lile, and C. R. Zeisse, inventors (to Navy) Filed 27 Feb. 1984 17 p

(AD-D011048; US-Patent-Appl-SN-583560) Avail: NTIS HC A02/MF A01 CSCL 13/8

A method for annealing semiconductor samples, especially following ion-implantation of semiconductor samples is disclosed. A furnace on a set of rails is passed over the semiconductor sample which is supported on a stationary wire basket made of low thermal mass, fine tungsten wire. The furnace temperature may be about 5 deg above the desired anneal temperature of the semiconductor sample such that the sample temperature rises to within a few degrees of the furnace temperature within seconds. Utilizing the moveable furnace insures uniform heating without elaborate temperature control or expensive beam generating equipment. The apparatus and process of the present invention are utilized for rapid annealing of ion-implanted indium phosphide semiconductors within 10 to 30 seconds and at temperatures of approximately 700 deg C, thereby eliminating undesired and damaging movement of impurities within the ion-implanated InP. Author (GRA)

N84-29028# Los Alamos Scientific Lab., N. Mex.

MAGNETIC REFRIGERATION: THE PROMISE AND THE PROBLEMS

J. A. Barclay 1984 6 p refs Presented at 21st Space Congr., Cape Kennedy, Fla., 24 Apr. 1984

(Contract W-7405-eng-36)

(DE84-007481; LA-UR-84-745-; CONF-8404116-1) Avail: NTIS HC A02/MF A01

Magnetic refrigeration which uses the temperature and field dependence of the entropy of some magnetic materials to accomplish cooling was developed. The high efficiency of the magnetization and demagnetization process and the potential for excellent heat transfer between solids and fluids, magnetic refrigerators offers higher efficiency than existing gas cycle refrigerators. These devices give high reliability and low volume and mass per unit cooling power. The arguments for high efficiency

and the problems that will need to be solved to achieve this goal are discussed. E.A.K.

N84-29029# Oak Ridge Y-12 Plant, Tenn.
MACHINE MONITORING FOR TURNING MACHINE
W. E. Barkman, G. P. Wieger, and L. M. Woodard 10 Jan. 1984 14 p Presented at the Soc. of Manufacturing Engr. Conf. on Sensor Technol. for Untended Manufacturing, Chicago, 5 Apr. 1984
(Contract DE-AC05-84OS-21400)
(DE84-010214; Y/DX-542; CONF-8404122-1) Avail: NTIS HC A02/MF A01

A prototype system used to monitor the status of a turning operation that provides high quality hemispherical work pieces is described. Data are collected from a variety of sensors and part quality in real time are compared with historical data from an on-line computer data base. The techniques developed on this system will be implemented in a precision flexible manufacturing cell that will operate in partly untended mode. A combination of on-machine monitoring and off-machine gaging will ensure that workpieces leaving the cell have in-tolerance characteristics. E.A.K.

N84-29030# Research Inst. of National Defence, Stockholm (Sweden).
FOA-SUB UNDERWATER VEHICLE SYSTEM: A BRIEF DESCRIPTION OF THE SYSTEM AND ITS STATE, SPRING 1984
Gunnar Axelsson and Goeran Stensson Mar. 1984 16 p refs In SWEDISH; ENGLISH summary
(FOA-C-20536-E1(E3); ISSN-0347-3694) Avail: NTIS HC A02/MF A01

An unmanned propeller-driven vehicle system, with power supplied from ashore by an electrical cable, was built. After testing, it was used as a tool in underwater applications, and subsystems were rebuilt and completed. Capacity of the data program for operation and control of the vehicle are reported. The hydroacoustic precision navigation system is outlined. Author (ESA)

N84-29031# Sheffield Univ. (England). Dept. of Control Engineering.
SOME NOTES ON OPTIMIZATION OF CONFIDENCE BANDS IN PROCESS CONTROL BASED ON APPROXIMATE MODELS
D. H. Owens and A. Chotai Feb. 1983 12 p
(Grant SERC-GR/B/23250)
(RR-215) Avail: NTIS HC A02/MF A01

Convex optimization problems over finite dimensional spaces are studied. A duality problem is resolved. Author (ESA)

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N84-29032# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technology.
GREEN'S FUNCTION FOR A DIELECTRIC WAVE-GUIDE FILLED WITH A DISPERSION MEDIUM [FUNKCJA GREENA DLA DIELEKTRYCZNEGO OSRODKIEM DYSPERSYJNYM]
Maciej Sowinski 1983 28 p refs
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

The electromagnetic field originating from a linear current of arbitrary time dependence was examined for a planar wave guide model formed from three homogeneous and isotropic layers of dispersion media. Green's vector functions and scalar function were utilized for the described model. With the use of the Fourier transformations, the problem of investigating Green's scalar function was reduced to one of solving the linear equation proposed by Helmholtz. Boundary conditions were formulated based on a partial Fourier transform of Green's function at points of contact of the layers. The equation is solved using the Felsen and Marcuvitz method. The results demonstrate the possibility of using the described procedure to study electromagnetic fields originating from nonlinear currents, and in particular to investigate spatio-temporal and temporal spatial modes. Author

N84-29033 Plessey Co. Ltd., Romsey (England).
HORIZON AND PRIME COMMUNICATION PROGRAMS HCP AND PCP
K. Whitmarsh Jan. 1984 11 p
(Rept-72/84/R006U) Copyright. Avail: Issuing Activity

Programs used to transfer text files between the mini-floppy diskettes on a North Star Horizon microcomputer executing the operating system CP/M-80, and a disk device on a Prime 550 minicomputer executing the operating system Primos rev 18.3 are described. The instructions to these programs defining the file transfers to be carried out are entered on the VDU of the Horizon by the operator via an option menu. Options exist to transfer files in both directions and to allow access to the Prime computer via the VDU on the Horizon. When an attempt is made to create a file which already exists the operator is asked to confirm or change the action. Author (ESA)

N84-29034# Polish Academy of Sciences, Warsaw.
REPRESENTATION OF TEM FEIDLS IN GYROTROPIC MEDIA BY SCALAR HERTZ POTENTIALS
Wlodzimierz Laprus and Stanislaw Przezdziecki 1984 21 p refs (ISSN-0208-5658) Avail: NTIS HC A02/MF A01

In isotopic media every two solutions of the Helmholtz equation are scalar Hertz potentials for an electromagnetic field. The field is found by applying to the potentials the well known differential formulae. The homogeneous Maxwell equations are satisfied. In short, given two scalar Hertz potentials, the corresponding electromagnetic field is determined. Every TEM field in a domain D of a gyrotropic medium is expressed in terms of four analytic functions defined in D (sub zero), which is the projection of D onto the xy plane. The correspondence between a TEM field and the appropriate four analytic functions is unique. However, the scalar Hertz potentials are defined nonuniquely: there exist more than one pair of Hertz potentials corresponding to a given TEM field. B.G.

N84-29035*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN INVESTIGATION OF THE EXISTENCE OF A SURFACE WATER LAYER ON AIRCRAFT RADOMES DURING SIMULATED FLIGHT IN HEAVY PRECIPITATION
J. R. Branstetter, M. C. Bailey, C. P. Hearn, R. E. Dunham, Jr., R. H. Couch, H. A. Verstynen, G. L. Gentry, Jr., and J. B. Williams Jun. 1984 93 p refs Prepared in cooperation with FAA, Hampton, Va.
(Contract DOF-FA79WAI-061)
(NASA-TM-85813; NAS 1.15:85813) Avail: NTIS HC A05/MF A01 CSCL 20N

An experiment to investigate the electromagnetic attenuation effects of an impacting water spray on an aircraft weather radome was conducted in Langley's 4 X 7 m. wind tunnel equipped with a water spray system. Results indicate no significant liquid water film formed at the stagnation point of the radome under the test conditions. However, a water sheath was observed standing away from the radome surface, which could possibly have significant attenuation properties of its own. Due to the lack of fidelity in modeling both the natural environment with the tunnel apparatus and the water sheath, it is recommended that further studies be undertaken to better define the water distribution in the vicinity of the radome and measure its effect on weather radar performance. Author

N84-29036# Japan Broadcasting Corp., Tokyo. Radio Engineering Research Div.
PERCEIVED C/U RATIO MEASURING EQUIPMENT FOR TV GHOST IMAGES
Shigeru Yamazaki May 1984 13 p ref

(NHK-Labs-Note-300; ISSN-0027-657X) Avail: NTIS HC A02/MF A01

A psycho-physical quantity Perceived D/U Ratio (PDUR) is proposed, by which the quality of pictures impaired by ghosts can be objectively determined. The PDUR measuring equipment is developed using digital techniques involving a microprocessor, which makes it possible to measure PDUR in the field within 60 seconds for each TV channel. The measured accuracy of PDUR is within + or - 2 dB at less than 30 dB PDUR. This accuracy is sufficient for practical use. The equipment, principles of measurement involved, and performance are described. M.A.C.

N84-29037# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

ACQUISITION COST ANALYSIS FOR THE NEAR TERM MILITARY APPLICATION OF LASER VERSUS MILLIMETER WAVE FOR SATELLITE CROSSLINK COMMUNICATIONS M.S. Thesis

S. W. Marlow Dec. 1983 103 p

(AD-A141061; AFIT/GSO/OS/83D-6) Avail: NTIS HC A06/MF A01 CSCL 17/2

Two alternative satellite communication technologies have evolved independently of each other and now seem to be in direct competition for limited R&D dollars. In an attempt to identify which technology is best, this study concentrates on one aspect of satellite communications - intersatellite crosslinks which are capable of processing one to ten megabits of data per second. The analysis effort is further limited to comparisons of procurement costs and factors which influence these costs. The RCA PRICE Model is used to estimate costs of crosslink subsystems. Extensive review of the literature, as well as design estimates from experts, is necessary to provide the PRICE Model with sufficient details to produce a credible cost figure. A modified Delphi method is used to aggregate the estimates of the experts. From the cost comparison of laser versus millimeter wave crosslink systems, it seems that millimeter wave with its more mature technology has the cost advantage. However, as laser technology reaches a level of maturity close to that of millimeter wave, the difference in procurement costs should become minimal. There are eleven technical, operational, and cost factors which must be analyzed to adequately determine which technology is best. Procurement cost analysis by itself does not determine which technology should be continued or stopped. Author (GRA)

N84-29038# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Mathematics and Computer Scien.

NONLINEAR WAVE PROPAGATION Annual Technical Report

Mark J. Ablowitz 30 Dec. 1983 48 p

(Grant AF-AFOSR-3674-78; AF Proj. 2304)

(AD-A141098; AFOSR-84-0392TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The essential point of view involved in this work is the continued of certain fundamental features associated with the nonlinear wave propagation arising in and motivated by physical problems. The usefulness of the work is attested to by the varied applications, and wide areas of interest in physics, engineering and mathematics. The work accomplished involves wave propagation in fluid mechanics and nonlinear optics, multidimensional solutions, multidimensional inverse problems, Painlevé equations, long time asymptotic solutions, direct linearizations of certain nonlinear wave equations, DBAR problems, Riemann-Hilber boundary value problems, etc. Author (GRA)

N84-29039# Northwestern Univ., Evanston, Ill. Dept. of Electrical Engineering and Computer Science.

THE EFFECT OF TURBULENCE ON THE ATMOSPHERIC TRANSMITTANCE Final Report, 1 Jul. - 30 Sep. 1983

M. A. Plonus and S. J. Wang Hanscom AFB, Mass. AFGL Sep. 1983 63 p

(Contract F19628-81-K-0057; AF Proj. 2688)

(AD-A141133; AFGL-TR-84-0007) Avail: NTIS HC A04/MF A01 CSCL 20/14

This report describes the effect of turbulence of the atmospheric transmittance. The fluctuation of transmittance due to turbulence is incorporated into the Lowtran computer code in terms of two subroutines for plane wave sources and beam wave sources (including spherical wave sources), respectively. These two subroutines calculate the intensity and power scintillation index. The square root of these indices is then used to define the upper and lower bounds of transmittance deviation. The calculations are for point receivers as well as for finite aperture receivers which exhibit the aperture averaging effect. Author (GRA)

N84-29040# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.

BASIC EMC (ELECTROMAGNETIC COMPATIBILITY) TECHNOLOGY ADVANCEMENT FOR c3 SYSTEMS. VOLUME 1: A NONLINEAR MACROMODEL OF THE BIPOLAR INTEGRATED CIRCUIT OPERATIONAL AMPLIFIER FOR ELECTROMAGNETIC INTERFERENCE ANALYSIS Final Technical Report, Jun. 1981 - Jun. 1982

G. K. C. Chen and J. J. Whalen Griffiss AFB, N.Y. RADC Dec. 1983 137 p 6 Vol.

(Contract F30602-81-C-0062; AF Proj. 2338)

(AD-A141369; RADC-TR-82-286-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 09/5

A macromodel containing two transistors can accurately predict how amplitude modulated RF signals with RF carrier frequencies in the 0.05 to 100.0 MHz range are demodulated in bipolar operational amplifiers (micro A741 and LM10 op amps) to cause undesired low frequency responses related to the modulation envelope of the RF signals. The original op amp macromodel which was developed by Boyle at al was modified by adding four capacitors C(sub) to account for parasitic capacitance effects in integrated circuit op amps. A procedure for assigning C(sub) values is given. The macromodel can be used when the RFI signals are incident upon the op amp input terminals. The use of the macromodel leads to a substantial reduction in computer time and expense. The ability of the nonlinear macromodel to represent the overall integrated circuit nonlinear response with only two transistors at the input stage is explained using the feedback theory of cascaded nonlinear transfer functions. In an operational amplifier with a linear feedback in its second stage, the nonlinear response of the second stage is suppressed. The overall nonlinear response is dominated by the nonlinearities of the input stage.Author (GRA)

N84-29041# Boeing Co., Seattle, Wash.

C3I SYSTEM MODIFICATION AND EMC (ELECTROMAGNETIC COMPATIBILITY) METHODOLOGY, VOLUME 1 Final Technical Report

J. L. Wilson and M. B. Jolly Griffiss AFB, N.Y. RADC Jan. 1984 37 p

(Contract F30602-80-C-0062; AF Proj. 2338)

(AD-A141420; D180-27211-1-Vol-1; RADC-TR-83-237-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 17/2

A methodology (i.e., consistent set of procedures) for assessing the electromagnetic compatibility (EMC) of RF subsystem modifications on C3I aircraft was generated during this study (Volume 1). An IEMCAP (Intrasystem Electromagnetic Compatibility Analysis Program) database for the E-3A (AWACS) C3I aircraft RF subsystem was extracted to support the design of the EMC assessment methodology (Volume 2). Mock modifications were performed on the E-3A database to assess, using a preliminary form of the methodology, the resulting EMC impact. Application of the preliminary assessmerit methodology to modifications in the E-3A database served to fine tune the form of a final assessment methodology. The resulting final assessment methodology is documented in this report in conjunction with the overall study goals, procedures, and database. It is recommended that a similar EMC assessment methodology be developed for the power subsystem within C3I aircraft. It is further recommended that future EMC assessment methodologies be developed around expert systems (i.e., computer intelligent agents) to control both the excruciating detail and user requirement for transparency.

Author (GRA)

N84-29042# Logicon, Inc., San Diego, Calif. Tactical and Training Systems Div.
WHITE PAPER: AN OVERVIEW OF HOW THE IFFN (IDENTIFICATION FRIEND, FOE, OR NEUTRAL) EVALUATION TESTBED SYSTEM WILL BE USED
15 Nov. 1983 18 p Sponsored by IFFN Joint Test Force
(AD-A141453; Rept-85-0061) Avail: NTIS HC A02/MF A01 CSCL 17/7

This paper describes how the Identification Friend, Foe, or Neutral (IFFN) Evaluation Testbed Systems will be used to investigate aircraft identification problems in combat air defense. The system will fulfill the urgent needs of realism, analysis of air defense reactions, and flexibility. These needs will be met through a large-scale Central Simulation Facility and inclusion of both live and simulated participating units such as a PATRIOT Battery. The three major subsystems, all automated to the greatest extent practicable and designed for use by operational personnel are: pretest, which includes test specification, scenario planning, and scenario generation; realtime; which includes initialization, setup, warmup, realtime trial, and end of trial; and posttest, which includes data collection, reduction, and analysis. Author (GRA)

N84-29043# National Oceanic and Atmospheric Administration, Boulder, Colo.
COMPARISON OF AIRBORNE TURBULENCE-INDICATING DOPPLER RADAR SYSTEMS WITH GROUND-BASED DOPPLER RADAR SYSTEMS Final Report, 15 May 1981 - 15 Mar. 1982
B. L. Trotter 13 Jan. 1983 54 p
(Contract DTFA01-81-Y-10557)
(AD-A141474; DOT/FAA/PM-84/3) Avail: NTIS HC A04/MF A01 CSCL 17/9

To promote air safety, FAA has undertaken the task of maintaining current knowledge of the state of the design of turbulence-indicating weather radars. The airborne turbulence-indicating radar is a translation of ground-based radar technology to the airborne environment. Comparisons are made between data sets of the airborne turbulence-indicating radars and a ground-based Doppler radar with turbulence (second moment) capabilities. No comparison is intended between the airborne systems. Author (GRA)

N84-29044# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
ANALOG SINGLE CHANNEL COMMUNICATION TRANSMITTER AND RECEIVER TESTS Final Report
3 Apr. 1984 76 p
(AD-A141480; ITOP-6-2-242) Avail: NTIS HC A05/MF A01 CSCL 17/2

Outlines test procedures and methods for use in evaluating the operational performance of analog receivers, transmitters, and transceivers. Includes data reduction formats. Author (GRA)

N84-29045# SRI International Corp., Menlo Park, Calif.
PACKET RADIO TEMPORARY NOTE INDEX
7 May 1984 21 p
(AD-A141528; AD-E000566) Avail: NTIS HC A02/MF A01 CSCL 17/2

Each PRTN entry is followed by the acronym for the authoring company. Complete U.S. Mail and, when available, ARPANET addresses for each company can be found in the appendix. Entries without a date had not been published at the time of this printing. GRA

N84-29046# Naval Research Lab., Washington, D. C.
COMPARISON OF SIX INTEGRATORS USED IN LONG-TERM RADAR INTEGRATIONS Interim Report
B. H. Cantrell 6 Apr. 1984 32 p
(AD-A141536; AD-E000569; NRL-8796) Avail: NTIS HC A03/MF A01 CSCL 17/9

Six integrators used in long term radar integration were studied. Generally, we found, even in fairly dense background of targets, that there was significant improvement in target detection due to the long term integration and that the false target generation could be controlled. The mechanism that allowed this result is based on removing a small percentage of the strongest signal in each integrator. This mechanism removed the few true target signals in many of the integrators which could cause ghost detections that were not valid targets. Using this technique, the false detections were easily controlled at only a very small expense in true target detectability. GRA

N84-29047# Delaware Univ., Newark.
ON THE SCATTERING OF ELECTROMAGNETIC WAVES BY PERFECTLY CONDUCTING BODIES MOVING IN VACUUM. PART 2: SCATTERING BY STATIONARY PERFECT CONDUCTORS Final Technical Report
A. G. Dallas Griffiss AFB, N.Y. RADC Apr. 1984 68 p
(Contract F30602-81-C-0169; AF Proj. 4600)
(AD-A141548; AMI-TR-144A-Pt-2; RADC-TR-84-9-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 12/1

The equations derived for the problem of electromagnetic scattering from a perfectly conducting body undergoing general non-rigid motion in Part 1 of this series are specialized for the case when the body is stationary. The simplification of the reformulation of the problem as an integro-differential equation is carried out explicitly in this case and a constructive method of solution is presented. Author (GRA)

N84-29048# Delaware Univ., Newark. Applied Mathematics Inst.
ON THE SCATTERING OF ELECTROMAGNETIC WAVES BY PERFECTLY CONDUCTING BODIES MOVING IN VACUUM. PART 5: A DESCRIPTION OF MOTION AND DEFORMATION RETARDATION OF SETS AND FUNCTIONS Final Technical Report
A. G. Dallas Griffiss AFB, N.Y. Apr. 1984 150 p
(Contract F30602-81-C-0169; AF Proj. 4600)
(AD-A141549; AMI-TR-145A-Pt-5; RADC-TR-84-9-Pt-5) Avail: NTIS HC A07/MF A01 CSCL 12/1

The idea of a Motion is introduced as a mathematical framework within which to describe a fairly broad class of moving and deforming bodies. The implications of the definition are explored. In particular, the space-time track of the motion is represented in terms of the instantaneous positions of the moving body. The spatial projections of the intersections of the space-time track of a motion with characteristic cones are represented and studied. Finally, classes of smooth motions are identified. The additional properties of such motions, including the existence of a normal velocity field, are established. Author (GRA)

N84-29049# Joint Test Force, Kirtland AFB, N.Mex. Identification Friend Foe Or Neutral.
PROGRAM MASTER PLAN
Jan. 1984 68 p
(AD-A141554) Avail: NTIS HC A04/MF A01 CSCL 17/2

The purpose of the Identification Friend, Foe, or Neutral Joint Test and Evaluation (IFFN JT/E) is to assess baseline US capabilities within the North Atlantic Treaty Organization (NATO) air defense command and control (C2) system to perform the IFFN function, identify deficiencies in the performance of that function, and propose potential near-term procedural and equipment modifications for further testing. The purpose of this document is to serve as an internal management tool, provide an overview of the objectives, background, concept of execution, resource requirements, and acquisition concept of the IFFN JT/E and to provide an umbrella document identifying the roles of all participating agencies. GRA

N84-29050# Delaware Univ., Newark. Applied Mathematics Inst.
ON THE SCATTERING OF ELECTROMAGNETIC WAVES BY PERFECTLY CONDUCTING BODIES MOVING IN VACUUM. PART 3: REPRESENTATIONS OF SUFFICIENTLY SMOOTH SOLUTIONS OF MAXWELL'S EQUATION AND OF THE SCATTERING PROGRAM Final Technical Report
A. G. Dallas Griffiss AFB, N.Y. RADC Apr. 1984 62 p

(Contract F30602-81-C-0169; AF Proj. 4600)
(AD-A141584; AMI-TR-143A; RADC-TR-84-9-Pt-3) Avail: NTIS HC A04/MF A01 CSCL 12/1

A representation of electromagnetic fields exterior to a perfectly conducting object undergoing general non-rigid motion is derived in terms of boundary integrals. The representation of the field involves scalar and vector potentials and the representation is the counter part of the Stratton-Chu or Maue representations in the stationary case. However, the motion complicates the representation considerably and this is shown explicity. Author (GRA)

N84-29051# Delaware Univ., Newark. Applied Mathematics Inst.
ON THE SCATTERING OF ELECTROMAGNETIC WAVES BY PERFECTLY CONDUCTING BODIES MOVING IN VACUUM. PART 1: FORMULATION AND REFORMULATION OF THE SCATTERING PROBLEM Final Technical Report
A. G. Dallas Griffiss AFB, N.Y. RADC Apr. 1984 310 p
(Contract F30602-81-C-0169; AF Proj. 4600)
(AD-A141746; AMI-TR-142A-Pt-1; RADC-TR-84-9-Pt-1) Avail: NTIS HC A14/MF A01 CSCL 12/1

The problem of determining the scattered electromagnetic field produced when an initially quiescent incident field impinges upon a perfectly conducting body moving and deforming in vacuum is originally formulated as an initial-boundary-value problem for Maxwell's equations in a noncylindrical exterior domain in space-time. The motion and deformation of the scatterer are allowed to be fairly general, the essential hypotheses being that the boundry of its space-time track is smooth and can be mapped and smoothly onto a cylinder, while the speeds of points on the body must remain less than that of light in vacuum. Within this setting, uniqueness theorems are proven for various initial-boundary-value problems for a system of generalized Maxwell equations (in particular, for the scattering problem), and for the scalar wave equation, in noncylindrical domains. GRA

N84-29052# Delaware Univ., Newark. Applied Mathematics Inst.
ON THE SCATTERING OF ELECTROMAGNETIC WAVES BY PERFECTLY CONDUCTING BODIES MOVING IN VACUUM. PART 4: KINEMATIC SINGLE LAYER POTENTIALS Final Technical Report
A. G. Dallas Griffiss AFB, N.Y. RADC Apr. 1984 342 p
(Contract F30602-81-C-0169; AF Proj. 4600)
(AD-A141747; AMI-TR-144A-Pt-4; RADC-TR-84-9-Pt-4) Avail: NTIS HC A15/MF A01 CSCL 12/1

Kinematic single layer potentials are defined as certain functions generated by the intrinsic objects associated with a smooth motion and a density function defined on the boundary of the space-time track of the motion. These constitute generalization of the classical single layers associated with the Laplace operator. The support, continuity, and differentiability properties of these functions are examined. In particular, it is shown that the partial derivations of kinematic single layer potentials generally exhibit jump discontinuities on the boundary of the space-time track of the generating motion; the interior and exterior limiting values of these partial derivatives at the boundary are derived.
Author (GRA)

N84-29053# Delaware Univ., Newark. Applied Mathematics Inst.
ON THE SCATTERING OF ELECTROMAGNETIC WAVES BY PERFECTLY CONDUCTING BODIES MOVING IN VACUUM. PART 6: MANIFOLDS IN EUCLIDEAN SPACES, REGULARITY PROPERTIES OF DOMAINS Final Technical Report
A. G. Dallas Griffiss AFB, N.Y. RADC Apr. 1984 190 p
(Contract F30602-81-C-0169; AF Proj. 4600)
(AD-A141748; AMI-TR-146A-Pt-6; RADC-TR-84-9-Pt-6) Avail: NTIS HC A09/MF A01 CSCL 12/1

Various standard results concerning manifolds in euclidean spaces, coordinate systems, and functions defined on such manifolds are developed and organized. For example, conditions are identified under which the image of a manifold is again a manifold. A development of Lebesgue measure and integration on a manifold is presented. Included is a change-of-variables formula for the transformation of an integral over a manifold to integration over a second manifold suitably related to the first. Classes of regular domains are defined. Special attention is given to those regular domains possessing a Holder-continuous exterior unit normal field, or Lyapunov domains. Slightly modifying the standard presentations, geometric and analytic properties of the boundary of a Lyapunov domain are derived, including the identification of certain canonical tangent-plane coordinate systems. Author (GRA)

N84-29054# Institut fuer Digitale Bildverarbeitung und Graphik, Graz (Austria).
DIFFERENTIAL RECTIFICATION OF SLR-IMAGES USING MAP-DERIVED AND RADAR-GENERATED DIGITAL ELEVATION MODELS Final Technical Report, 1 Jan. 1983 - 29 Feb. 1984
G. Domik, F. Leberl, and J. Raggam 29 Feb. 1984 75 p
(Contract DAJA45-83-C-0018; DA Proj. 1T1-61102-BH-57)
(AD-A141828) Avail: NTIS HC A04/MF A01 CSCL 17/9

A multi step approach to rectify radar images geometrically and radiometrically is presented. The method uses digital elevation models (DEMs) and an image simulator to establish the relation between radar image coordinates and ortho image locations. The simulation serves to create a synthetic gray value image similar in its geometry to the real radar image, associating with each image pixel a backscatter value dependent on the incidence angle and a DEM address. Correlation between simulated and real and real image results in a relation between radar backscatter values and DEM addresses and produces an ortho image in an additional step. Stereo derived and map derived elevation models were used to demonstrate the rectification process for air and spaceborne radar images. Author (GRA)

N84-29055# Johns Hopkins Univ., Baltimore, Md. Dept. of Electrical Engineering and Computer Science.
STRICT REDUNDANCY SCHEMES FOR NON-SEQUENTIAL DETECTOR RELIABILITY. PART 1: ANALYSIS
H. L. Weinert and G. G. L. Meyer 4 Jun. 1984 24 p
(Contract N00014-81-K-0813)
(AD-A141875; JHU/EECS-84/09) Avail: NTIS HC A02/MF A01 CSCL 17/2

In this work, we analyze the effects of hardware faults on the performance of computer-implemented signal detectors, as measured by the probability of detection and the probability of false alarm. We derive performance bounds for three implementations: (1) no redundancy, (2) error masking through strict redundancy, and (3) error detection and masking through strict redundancy. Author (GRA)

N84-29056# TRW Space Technology Labs., Redondo Beach, Calif.
THE NATURE OF MICROWAVE BACKSCATTERING FROM WATER WAVES Final Report, 1 Oct. 1982 - 1 Oct. 1983
D. S. W. Kwoh and B. M. Lake May 1984 36 p
(Contract N00014-81-C-0217)
(AD-A141877; TRW-37564-6002-UT-00) Avail: NTIS HC A03/MF A01 CSCL 20/14

Our recent laboratory study shows that Bragg scattering by itself is not an adequate description for microwave backscattering from water waves. It may account for part of the scattering, but reflection from specular facets and wedge-like diffractive scattering from small radius crests of waves can predominate. Our first experiment was performed on wave paddle-generated short gravity waves. Using a scanning laser slope gauge to measure the surface and the moments method to compute the scattering, we found that the small radius crests of such waves can be the more dominant source of scattering and that the description of such scattering is closer to wedge diffraction than Bragg scattering. Bragg scattering does describe the scattering from the parasitic capillaries. We also found that specular reflection is more important than generally expected. Our second experiment was performed on wind waves. We found that at low wind, the Doppler spectrum

is narrow peaked but it gradually evolves to become a doubly peaked spectrum at high wind. Analysis shows that low wind scattering is indeed Bragg scattering. At high wind, the lower frequency peak again is due to Bragg scattering from rough patches, whereas the higher frequency peak is due to scattering from waves not unlike the paddle-generated short gravity waves. Author (GRA)

N84-29057# Institute for Defense Analyses, Alexandria, Va.
F/A-18 AN/APG-65 RADAR CASE STUDY REPORT (IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
P. F. Goree Aug. 1983 287 p
(Contract MDA903-79-C-0018)
(AD-A142103; AD-E500658; IDA-D-20; IDA/HQ-83-25930) Avail: NTIS HC A13/MF A01 CSCL 17/9

This document records the activities and presents the findings of the F/A-18 AN/APG-65 Radar Case Study Working Group part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through August 1983. GRA

N84-29058# Institute for Defense Analyses, Alexandria, Va.
AN/TPQ-36 AND AN/TPQ-37 FIREFINDER RADARS CASE STUDY REPORT (IDA/OSD R AND M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RESEARCH AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
P. F. Goree Aug. 1983 209 p
(Contract MDA903-79-C-0018)
(AD-A142104; AD-E500655; IDA-D-24; IDA/HQ-83-25896) Avail: NTIS HC A10/MF A01 CSCL 17/9

This document records the activities and presents the findings of the AN/TPQ-36 and AN/TPQ-37 Firefinder Radar Case Study Working Group part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through August 1983. GRA

N84-29059# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTION OF PENETRATING RADIATION ON RADIO PARTS
G. A. Goryacheva, A. A. Shapkin, and L. G. Shirshev 24 May 1984 263 p Transl. into ENGLISH of mono. "Deystviye Pronikayushchey Radiatsii na, Radiodetali" Moscow, Atomizdat, 1971 p 1-119
(AD-A142107; FTD-ID(RS)T-1676-83) Avail: NTIS HC A12/MF A01 CSCL 17/2

The effect of the ionizing radiations/emissions on the electrophysical characteristics of the materials, utilized for producing radio parts is examined. Primary attention is paid to the theoretical and experimental investigations of the character of a change of parameters of materials in the conditions for pulse and continuous gamma and neutron radiations/emissions. Author

N84-29060# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Electrical Computer and Systems Engineering.
ADAPTIVE SPREAD SPECTRUM RECEIVER USING ACOUSTIC SURFACE WAVE TECHNOLOGY Final Report, 1 Apr. 1981 - 31 Mar. 1984
P. Das and L. B. Milstein 31 May 1984 71 p
(Contract DAAG29-81-K-0066)
(AD-A142129; ARO-17570.8-EL) Avail: NTIS HC A04/MF A01 CSCL 17/2

This technical report summarizes the results of the research we have been engaged in regarding the use of surface acoustic wave devices in direct sequence spread spectrum receivers. The heart of this research has been the use of the device as a real-time Fourier transformer. A system of this type is sometimes referred to as a compressive receiver, and our use of the system has been primarily as a means to implement a narrowband interference rejection filter. In addition, we have studied many other topics such as rapid acquisition, Hilbert transform generation, etc. and these topics are all overviewed in this report. Author (GRA)

N84-29061# National Bureau of Standards, Washington, D.C. Time and Frequency Div.
SUMMARY OF WORK ON COOLED ION FREQUENCY STANDARD, FISCAL YEAR 1984 Annual Report, Oct. 1983 - Sep. 1984
D. J. Wineland 15 Jun. 1984 13 p
(Contract N00014-84-F-0007)
(AD-A142189) Avail: NTIS HC A02/MF A01 CSCL 07/4

The purpose of this work is to develop techniques to overcome the fundamental limits of present frequency standards - the second and residual first-order Doppler shifts. To this end we study suitable frequency reference transitions in ions which are stored on electromagnetic traps and cooled by radiation pressure to $< 1K$. Author (GRA)

N84-29062# Georgia Inst. of Tech., Atlanta.
ARTIFICIAL INTELLIGENCE APPLIED TO SPECTRUM ESTIMATION
J. E. Gaby and M. H. Hayes 1984 5 p
(Contract DAAG29-81-K-0024; AF Proj. 2304)
(AD-A142202; AFOSR-84-0348TR) Avail: NTIS HC A02/MF A01 CSCL 17/2

Many techniques are available for the estimation of the power spectrum of a stationary random process. While power spectrum estimation is a problem which falls within the domain of signal processing, the problem of inferring information falls within the domain of artificial intelligence (AI). With a wide variety of different types of power spectrum estimation techniques to choose from, an equally wide range of differing spectral estimates may be produced. Each estimate, however, may be used to infer information about the time series. By defining an appropriate knowledge base, a system is being developed to infer information from power spectrum estimates. This system combines the estimates produced by a variety of current spectrum estimation techniques in order to formulate a composite spectral estimate. Author (GRA)

N84-29063# Random Applications, Inc., Montrose, Colo.
APPLICATIONS OF DIFFERENTIAL PHASE STATISTICS TO STUDIES OF C3 AND SPREAD SPECTRUM COMMUNICATIONS Interim Report, 1 May 1983 - 30 Apr. 1984
R. F. Pawula 9 May 1984 4 p
(Contract F49620-83-C-0085)
(AD-A142204; AFOSR-84-0463TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Five papers have been prepared under this contract in which recently developed differential phase statistics have been successfully employed to obtain error rate performance of differential modulation systems operating under practical conditions. These practical conditions included power imbalance, phase-change offset, noise correlations and intersymbol interference. The modulation systems considered were binary conventional and symmetric DPSK, offset DPSK, and M-ary DPSK. The channels studied were both terrestrial and satellite. Closed form expressions, requiring some numerical integration, were obtained in all cases. Extensive performance curves showing the effects of the various impairments were presented. Because satellite link performance depends strongly upon the qualities of the uplink, as shown, it was concluded that a satellite repeater is much less effective than a detect and remodulate transponder in a severe jamming environment. Asymptotic approximations to M-ary DPSK were shown to extremely good, and it was suggested that more emphasis be placed on such methods as opposed to the more traditional, but much less accurate, use of bounds. Author (GRA)

N84-29064# Columbia Univ., New York. Radiation Lab.
RESEARCH INVESTIGATION DIRECTED TOWARD EXTENDING THE USEFUL RANGE OF THE ELECTROMAGNETIC SPECTRUM Progress Report, 1 Apr. 1983 - 31 Mar. 1984
G. W. Flynn 31 May 1984 284 p
(Contracts DAAG29-82-K-0080; F49620-82-K-0008;

DAAG29-82-K-0089; N00014-78-C-0517; Grants AF-AFOSR-0013-84; NSF DMR-80-06966)
(AD-A142209; PR-34) Avail: NTIS HC A13/MF A01 CSCL 20/3

We have been studying the characteristics of light generated by distinctly non-Poisson processes. We are particularly interested in sub-Poisson light (light whose fluctuations are lower than those of lasers). The use of such quiet light can be beneficial, e.g., it can increase the distance between repeaters in a fiber-optic communications system. As an example of a mechanism for producing such light, we have begun studying a Franck-Hertz apparatus excited by a space-charge-limited electron beam. We have carried out extensive theoretical calculations of the properties of such a source of light and demonstrated that under suitable conditions it can indeed lead to antibunched and sub-Poisson photon emissions. We have also proved a quantum analog of the Burgess variance theorem. This confirmed that the sub-Poisson nature of a light beam is conserved in the presence of absorptive media and additive (Poisson) background light. Thus the sub-Poisson light can be used in a real detection system once it is generated. GRA

N84-29065# Systems and Applied Sciences Corp., Monterey, Calif.
ASSESSING AND DISPLAYING THE EFFECTS OF ELEVATED TRAPPING LAYERS IN SUPPORT OF NAVY COMMAND AND CONTROL Final Contractor Report
P. A. Petit and H. D. Hamilton Monterey, Calif. Naval Environmental Prediction Research Facility Mar. 1984 82 p
(Contract N00228-83-D-3059)
(AD-A142216; NEPRF-CR-84-01) Avail: NTIS HC A05/MF A01 CSCL 20/14

This study examines options presently or potentially available to the U.S. Navy for assessing and displaying the existence or likelihood of elevated trapping layers (ETL) and their associated ducts over a particular geographic point or area, in support of command and control (C2) functions related to such tactical considerations as detection, intercept, communication, guidance systems functioning and surveillance. Author (GRA)

N84-29066# Signatron, Inc., Lexington, Mass.
ADAPTIVE TECHNIQUES FOR TROPOSCATTER Final Technical Report, Nov. 1982 - Sep. 1983
M. S. Wallace, S. A. Parl, A. Malaga, and J. N. Pierce Griffiss AFB, N.Y. RADC Feb. 1984 281 p
(Contract F19628-82-C-0017)
(AD-A142226; RADC-TR-84-8) Avail: NTIS HC A13/MF A01 CSCL 17/2

This report examines the performance of phased array antennas with adaptive combining for troposcatter communications. Diversity is commonly employed to combat fading on troposcatter links. Diversity may be derived from a phased array by adaptive combining of the element outputs (space diversity) or equivalently by forming a set of beams via a Butler matrix transformation (angle diversity). A number of new results describing the performance of both azimuth and elevation angle diversity systems using phased arrays are derived and performance bounds for both azimuth and elevation diversity are found. A new class of sub-optimal combiners is examined. The effect of implicit diversity on wideband systems is considered. The degradation due to channel measurement errors is also determined. A measurement program is proposed to verify the results. The computer program which performs the common volume integration is described. Author (GRA)

N84-29067# Drexel Univ., Philadelphia, Pa. Dept. of Electrical and Computer Engineering.
AN INFORMATION-THEORETIC APPROACH TO TARGET ESTIMATION OF A LASER RADAR TRACKING SYSTEM Final Research Report, 1 Nov. 1981 - 31 Oct. 1982
P. R. Kalata 20 Jan. 1984 52 p
(Grant AF-AFOSR-0110-82)
(AD-A142247; AFOSR-84-0469TR) Avail: NTIS HC A04/MF A01 CSCL 20/5

High energy laser systems with highly accurate measurements as target tracking sensors use a conical scan process to obtain a target capture and tracking within the narrow beamwidth. This searching process and the target tracking algorithm are major factors in the performance of the laser radar/target tracking system. Previous research results use information-theoretic concepts in establishing a laser radar/target tracking performance bound independent of the filtering algorithm. A computer program was developed to calculate the lower bound of the estimation error due to the non-linear Gaussian glint measurement process. Applying the Extended Kalman filter to the angle estimation problem for a Gaussian glint measurement process, the resulting filter is found to have a structure consisting of a series of demodulations with gains adaptively determined by the resulting angle estimate. The optimal performance of this estimation process is shown to be dependent on the angle and a bound on the performance as well as a numerical algorithm is presented. Author (GRA)

N84-29068# Vermont Univ., Burlington. Dept. of Computer Science and Electrical Engineering.
SENSITIVITY BASED SEGMENTATION AND IDENTIFICATION IN AUTOMATIC SPEECH RECOGNITION Final Report, 1 Jan. - 31 Jul. 1983
R. Absher 30 Mar. 1984 71 p
(Grant AF-AFOSR-0053-83)
(AD-A142255; AFOSR-84-0476TR) Avail: NTIS HC A04/MF A01 CSCL 17/2

This research program continued an investigation of sensitivity analysis, and its use in the segmentation and identification of the phonetic units of speech, that was initiated during the 1982 Summer Faculty Research Program. The elements of the sensitivity matrix, which express the relative change in each pole of the speech model to a relative change in each coefficient of the characteristic equation, were evaluated for an expanded set of data which consisted of six vowels contained in single words spoken in a simple carrier phrase by five males with differing dialects. The objectives were to evaluate the sensitivity matrix, interpret its changes during the production of the vowels, and to evaluate inter-speaker variations. It was determined that the sensitivity analysis (1) serves to segment the vowel interval, (2) provides a measure of when a vowel is on target, and (3) should provide sufficient information to identify each particular vowel. Based on the results presented, sensitivity analysis should result in more accurate segmentation and identification of phonemes and should provide a practicable framework for incorporation of acoustic-phonetic variance as well as time and talker normalization. Author (GRA)

N84-29069# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
MULTICHANNEL LINEAR PREDICTIVE CODING OF COLOR IMAGES
P. A. Maragos, R. M. Mersereau, and R. W. Schafer 1984 0005 p
(Contract DAAG29-81-K-0024; AF Proj. 2304)
(AD-A142260; AFOSR-84-0355TR) Avail: NTIS HC A02/MF A01 CSCL 17/2

This paper reports on a preliminary study of applying single-channel (scalar) and multichannel (vector) 2-D linear prediction to color image modeling and coding. Also, the novel idea of a multi-input single-output 2-D ADPCM coder is introduced. The results of this study indicate that texture information in multispectral images can be represented by linear prediction coefficients or matrices, whereas the prediction error conveys edge-information. Moreover, by using a single-channel edge-information the investigators obtained, from original color images of 24 bits/pixel, reconstructed images of good quality at information rates of 1 bit/pixel or less. Author (GRA)

N84-29070# South Carolina Univ., Columbia. Dept. of Mathematics.
[ON THE DAMPED NONLINEAR EQUATION W SUB TT =

SIGMA (W) SUB XX GAMMA W SUB T] Interim Scientific Report, 15 May 1981 - 14 May 1982
F. Bloom May 1984 5 p Submitted for publication
(Grant AF-AFOSR-0171-81)
(AD-A142263; AFOSR-84-0474TR) Avail: NTIS HC A02/MF A01 CSCL 20/3

The investigator focused on and produced papers with the following titles: 'On a damped nonlinear evolution equation,' 'Nonexistence of smooth electromagnetic fields in nonlinear dielectrics, I infinite cylindrical dielectrics,' and 'Nonexistence of smooth electromagnetic fields in nonlinear dielectrics, II shock development in a half space.' Details on this research are contained in the report. GRA

N84-29071# Arcon Corp., Waltham, Mass.
ANALYSIS AND PROGRAMMING FOR ELECTROMAGNETIC APPLICATIONS Final Technical Report, Jul. 1981 - Dec. 1983
E. Cohen, N. Itkin, J. Holst, and N. Kerwin Griffiss AFB, N.Y. RADC May 1984 89 p
(Contract F19628-81-C-0117)
(AD-A142313; RADC-TR-84-95) Avail: NTIS HC A05/MF A01 CSCL 12/1

During the last 30 months, our technical work consisted of providing RADC scientists with mathematical and programming support in the following areas: magnetostatic wave transducer analysis; antenna analysis and design studies; conversion, implementation, and execution of ionospheric propagation programs; radar data analysis; electromagnetic scattering from rough terrains, etc. This work resulted in the development of mathematical models and computer programs. When desired, we functioned in a collaborative manner to assist with the physical formulation problems of interest. Author (GRA)

N84-29072# Rome Air Development Center, Griffiss AFB, N.Y.
GRATING LOBE CHARACTERISTICS OF ARRAYS WITH UNIFORMLY ILLUMINATED CONTIGUOUS SUBARRAYS
R. J. Mailloux Dec. 1983 17 p
(AD-A142332; RADC-TR-83-290) Avail: NTIS HC A02/MF A01 CSCL 09/5

This report presents simple approximate formulas and generalized curves to simplify evaluation of the grating lobe levels of various kinds of contiguous subarrays with uniform illumination within each subarray. The cases considered include phase quantization caused by discrete phase shifters, amplitude taper at subarray input ports, and time delay at the subarray input ports. Also, the work is generalized to include certain cases of quantized phase or time delay at the input ports in addition to amplitude taper at subarray input ports. Author (GRA)

N84-29073# California Univ., Livermore. Lawrence Livermore Lab.
APPLICATIONS OF RIEMANN-HILBERT PROBLEM TECHNIQUES TO ELECTROMAGNETIC COUPLING THROUGH APERTURES
R. W. Ziolkowski, W. A. Johnson, and K. F. Casey Jul. 1983 23 p refs Presented at the URSI Intern. Symp. on Electromagnetic Theory, Santiago de Compostela, Spain, 22-26 Aug. 1983 Submitted for publication
(Contract W-7405-eng-48)
(DE84-009532; UCRL-88169; CONF-8308165-1) Avail: NTIS HC A02/MF A01

The Riemann-Hilbert techniques as they are applied to problems of electromagnetic coupling through apertures are described and illustrated with the example of a plane wave incident on a slitted cylinder enclosing a concentric impedance surface. This problem encompasses the coupling to an empty cylinder as well as to a cylinder enclosing a conducting wire or cable. The results for various angles of incidence are presented for several cases of aperture and cylinder size. Special consideration is given to the case in which the direction of incidence coincides with an edge of the aperture and the center of the cylinder. Results are compared with those obtained using the moment method. DOE

N84-29074# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Hauptabteilung Raumfahrtprogramme.
A SAR SYSTEM TEST UNIT FOR VERIFICATION OF USER REQUIREMENTS Final Report, Oct. 1982
Wolfgang Gieraths and Rainer Ulbrich Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 211 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-002; ISSN-0170-1339) Avail: NTIS HC A10/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 37,50

A test unit for synthetic aperture radars (SAR) is presented. The unit presents a discriminating targets scenario synthetized in analog technique to the SAR in order to offer an abbreviated analysis. Radar pulses issued from the antenna part are modulated in the test unit with a complex spectrum which in its structure represents the target scenario and the platform motion. As in actual operation the echoes are reflected into the SAR receiver. Results confirm that the test apparatus is feasible as a compact unit with low power consumption, to be used for SAR ground tests and for satellite/airborne onboard versions. Author (ESA)

N84-29075# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Uebertragungstechnik.
DIGITAL SOUND TRANSMISSION METHODS FOR TV SOUND TRACKS Final Report, Mar. 1983
Willmut Zschunke and Joachim Habermann Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 165 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-007; ISSN-0170-1339) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33

Direct broadcasting satellite applications of digital sound transmission methods were compared. Subcarrier modulation, transmission in the horizontal blanking interval with the same modulation as the video signal or phase shift keying/frequency shift keying transmission were analyzed. Systems with 1.5 Mbit/sec, 2 Mbit/sec, and 3 Mbit/sec bit rates were compared. For a common European system it is concluded that while a bit rate of 1.5 Mbit/sec is sufficient for German purposes, bit rates of 3 Mbit/sec are necessary for other countries, e.g., Nordic countries. Author (ESA)

N84-29076# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
DIPOLE ARRAYS WITH SECTOR-SHAPED PATTERNS FOR APPLICATIONS IN MOBILE RADIO COMMUNICATIONS
Heinrich Hollmann Dec. 1983 40 p refs In GERMAN; ENGLISH summary
(FI-454-TBr-34) Avail: NTIS HC A03/MF A01

Base station antennas in sector-shaped small-cell service areas for the land mobile network (450 MHz) service are described. The antenna concept proposes a sector having an angular aperture of 60 deg served by an antenna array consisting of single antennas placed in front of a plane reflector plate. The synthesis of their patterns yields the desired sector-shaped pattern, the amplitude of which decreases steeply to values below -25 dB in the overlapping area between 30 and 40 deg of the horizontal angle. The only variables for obtaining the sector-shaped pattern are the number of single dipoles, their spacings, the beam direction, and the radiation pattern. The mathematical model of the single antenna corresponds to an array of single dipoles arranged as a broadside antenna in front of a reflector of infinite dimension. The pattern synthesis shows that the resulting distances between the dipoles are too small for the technical realization. The problem can only be solved by combining several dipoles to obtain a single antenna. Author (ESA)

N84-29077# AEG-Telefunken, Ulm (West Germany). Geschaeftsbereich Hochfrequenztechnik.
A 60 GHz PULSE RADAR FOR DETECTION OF HIGH VOLTAGE POWER LINES Final Report, Dec. 1982

Heinz-Georg Wippich, Bernhard Rembold, Heinrich Callsen, and Alfred Plattner Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 69 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-013; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14,50

A helicopter borne radar able to detect high power transmission lines > 20 mm diameter at a distance > 500 m is described. Radar power at 60 GHz constituted the critical point, but by using avalanche diodes, sufficient power for a radius of 600 m is possible. The following components were developed: mm-wave radar, scanner and mount, data processing and power supply, and laboratory display of data (C-Scope). Author (ESA)

N84-29078# Loughborough Univ. of Technology (England). Dept. of Mathematics.
ON THE BELL-SZEKERES SOLUTION FOR COLLIDING ELECTROMAGNETIC WAVES
J. B. Griffiths Mar. 1984 9 p refs
(MATHS-Res-176) Avail: NTIS HC A02/MF A01

The Bell-Szekeres solution, which describes the collision of plane electromagnetic waves, is considered. The solution is adapted to cases in which the approaching electromagnetic waves are of a specified finite duration, and the polarization of the approaching electromagnetic waves is nonaligned. Author (ESA)

N84-29079# Danish Meteorological Inst., Copenhagen.
HF OMNIDIRECTIONAL SPECTRAL CW AURORAL RADAR (HF-OSCAR) AT VERY HIGH LATITUDE. PART 1: TECHNIQUE
J. K. Olesen, K. E. Jacobsen, P. Stauning, and S. Henriksen 1983 33 p refs Sponsored by Danish Technical Science Foundation and Danish Space Research Board
(DMI-Geophys-Papers-R-67; ISBN-87-7478-205-3) Avail: NTIS HC A03/MF A01

An HF system for studies of very high latitude ionospheric irregularities was described. Radio aurora from field-aligned E-region irregularities of the Slant E Condition type were discussed. The complete system combines an ionosonde, a 12 MHz pulse radar and a 12 MHz bistatic CW Doppler-range set-up. The two latter units use alternately a 360 deg rotating Yagi antenna. High precision oscillators secure the frequency stability of the Doppler system in which the received signal is mixed down to a center frequency of 500 Hz. The Doppler shift range is max + or - 500 Hz. The received signal is recorded in analog form on magnetic tape and may be monitored visually and audibly. Echo range of the CW Doppler signal is obtained by a 150 Hz amplitude modulation of the transmitted signal and phase comparison with the backscattered signal. Author (ESA)

N84-29080# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Trans-Ueberschall-Entwurfsverfahren.
WAVE PROPAGATION FROM MOVING SINGULARITIES AND A UNIFIED EXPOSITION OF THE LINEARIZED THEORY FOR AERODYNAMICS AND ACOUSTICS
Arabindo Das Mar. 1984 70 p refs
(DFVLR-FB-84-17) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 22

The physical nature of spatial and temporal stretching effects arising from the motion of the singularities which influence wave propagation from moving disturbance sources, as occurring in electromagnetic, acoustic, and aerodynamic fields is analyzed. The singularities consisting of volume elements and surface elements possess arbitrary orientation in space and to the trajectory. Hence generally valid formulas for the stretching functions, which reveal universal relations and characteristic properties in the radiation field are obtained. A unified method for the solution of the linearized theory which is universally applicable for aerodynamics and acoustics is outlined. Author (ESA)

N84-29081# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
HEIGHT PROFILE OF THE FIELD STRENGTH OF RECEPTION BY MULTIPATH PROPAGATION IN THE cm WAVE RANGE [HOEHENPROFIL DER EMPFANGSFELDSTAERKE BEI MEHRWEGEAUSBREITUNG IM CM-WELLENBEREICH]
Hans-Georg Giloi Feb. 1984 33 p refs In GERMAN; ENGLISH summary
(FI-455-TBR-75) Avail: NTIS HC A03/MF A01

Height dependence of the field strength in multipath propagation in line of sight radio relay links is considered. Experiments were carried out with 14 antennas mounted one above the other at distances of 2 m. The frequency was 9.3 GHz; path length was 43 km. Fade-out and fade-up measurements were investigated. The three path model proves to be best adapted for this purpose. The amplitudes, the indicence angles, and phase differences of the three partial waves are found to be the parameters of the fading curves. For fade-ups, the one with the highest amplitude is larger than the free-space value. For fade-outs, it is smaller, i.e., strong focusing and defocusing effects occur together with multipath. Author (ESA)

N84-29082# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 1: Physics.
PROJECT NOORDWIJK, PART 5: ANALYSIS OF THE FADING COMPONENT OF THE RADAR BACKSCATTER
G. P. Deloor Apr. 1984 29 p refs
(AD-B083044; PhL-1984-21; TDCK-79156) Avail: NTIS HC A03/MF A01 CSCL 10/3

The variation of the fading component of radar backscatter from the sea through time is assessed by a series of descriptors for its spectra and its autocorrelation function derived from 6 min time series. Modulation was determined using the modulation index to study its dependency on grazing angle. The autocorrelation functions provide 2 decorrelation times, a short one of 7 to 9 msec associated with the capillaries and short gravity waves in resonance with the radar waves, and a second one on the order of 0.3 sec associated with the facets. Author (ESA)

N84-29083# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
LOW RATE VOICE TRANSMISSION BY A CLASSIFYING VOCODER Ph.D. Thesis [TRANSMISSION DE LA PAROLE A FAIBLE DEBIT PAR VOCODEUR A CLASSIFICATION]
MHamed Dabouz Jan. 1984 133 p refs In FRENCH
(ENST-84E002; ISSN-0751-1353) Avail: NTIS HC A07/MF A01

A dictionary for a classifying vocoder was developed. Learning algorithms are compared to classical vectorial quantification algorithms. The performance of the developed linear prediction algorithms are evaluated by objective criteria related to distortion measurement. The effects of a high pass filter on the learning algorithm and its advantages concerning the classification process are considered. It is demonstrated that the development of a dictionary for a classifying vocoder based on linear prediction does not require complexe algorithms. The developed threshold algorithm is an adequate choice. A hierarchic organization of the dictionary is recommended to obtain a fast access to the next model to be transmitted. Author (ESA)

N84-29105# Rome Air Development Center, Griffiss AFB, N.Y.
ANTENNA APPLICATIONS AND SYSTEM ENGINEERING
F. I. Diamond *In its* Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 13-15 (For primary document see N84-29104 19-33)
(AD-P003401) Avail: NTIS HC A12/MF A01 CSCL 09/5

N84-29106# Ball Aerospace Systems Div., Boulder, Colo.
FUNDAMENTAL DESIGN ISSUES FOR MONOLITHIC PHASED ARRAYS
R. J. Stockton *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 17-38 (For primary document see N84-29104 19-33)
(AD-P003402) Avail: NTIS HC A12/MF A01 CSCL 09/5

N84-29108# Sanders Associates, Inc., Nashua, N. H. Antennas and RF Systems Dept.
A WIDE BAND 44 GHz PRINTED CIRCUIT CONFORMAL ARRAY
D. F. Sedivec and B. F. Hubin *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 65-98 (For primary document see N84-29104 19-33)
(AD-P003404) Avail: NTIS HC A12/MF A01 CSCL 09/5

N84-29111# Sperry Rand Corp., Great Neck, N. Y. Defense Electronics Unit.
A COMPACT FULLY OVERLAPPING SUBARRAY ANTENNA
P. A. Valentino, J. J. Stangel, and S. Milazzo *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 135-164 (For primary document see N84-29104 19-33)
(Contract F19628-81-C-0078)
(AD-P003407) Avail: NTIS HC A12/MF A01 CSCL 09/5

N84-29112# Lockheed Electronics Co., Plainfield, N. J.
GEODESIC CONE ANTENNA
B. S. Cramer *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 165-189 (For primary document see N84-29104 19-33)
(AD-P003408) Avail: NTIS HC A12/MF A01 CSCL 09/5

N84-29114# Lincoln Lab., Mass. Inst. of Tech., Lexington.
EARTH COVERAGE CORRUGATED HORNS (44.5 GHz AND 20.7 GHz)
D. C. Weikle *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 207-225 (For primary document see N84-29104 19-33)
(AD-P003410) Avail: NTIS HC A12/MF A01 CSCL 09/5

N84-29469*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPEECH COMMUNICATIONS IN NOISE
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 57-110 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 17B

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N84-29084*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OXYGEN RECOMBINATION IN INDIVIDUAL PRESSURE VESSEL NICKEL-HYDROGEN BATTERIES Patent Application
J. J. Smithrick, inventor (to NASA) Filed 27 Jun. 1984 12 p
(NASA-Case-LEW-13822-1; US-Patent-Appl-SN-625077) Avail: NTIS HC A02/MF A01 CSCL 10C

In a metal hydrogen cell of the type including a number of electrical cell units in back-to-back relationship and which may be lined with a wick, one or more catalyzed sites are provided on the inner surface of the cell. Separators between the respective metal and hydrogen electrodes of each cell unit have gas directing notches around their peripheries to facilitate the desired movement of gasses within the metal-hydrogen cell. Any two metal electrodes separated by a gas screen and including apertures which may be required to accommodate compression means such as bolts, are provided with gas tight seals between the electrodes at each aperture. The sealing means may be ring of rubber or elastomeric material which is somewhat compressible but non-reactive with other materials in the cell. NASA

N84-29085*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ROTATABLE ELECTRIC CABLE CONNECTING SYSTEM Patent Application
David R. Manges, inventor (to NASA) Filed 23 May 1984 15 p
(NASA-Case-GSC-12899-1; US-Patent-Appl-SN-613140) Avail: NTIS HC A02/MF A01 CSCL 09C

A cable reel assembly is described that is particularly adapted for, but not limited to, a system for providing electrical connection of power and data signals between an orbiter vehicle, and a recovered satellite and being comprised of two mutually opposing ring type structures having plus or minus 180 degree relative rotation with one of the structures being held in fixed position while the other structure is rotatable. The cable sections are fed out as three output cable sections through openings in the central portion of the circular plate of the rotatable ring structure where they are directed to the latches and connectors located on its rim. NASA

N84-29086# Los Alamos Scientific Lab., N. Mex.
PLANT AND OPERATIONAL FEATURES OF THE BPA 30 MJ SUPERCONDUCTING MAGNETIC ENERGY STORAGE SYSTEM
John D. Rogers and John F. Hauer (Bonneville Power Administration, Portland, Oreg.) 1984 7 p refs Presented at the Intern. Symp. and Workshop on Dyn. Duties of Energy Storage Plants, Boston, 7-11 May 1984
(Contract W-7405-eng-36)
(DE84-006006; LA-UR-84-52; CONF-840515-1) Avail: NTIS HC A02/MF A01

A 30 MJ superconducting magnetic energy storage (SMES) system was designed and developed for application in the Western US Power System to damp power oscillations that limit high voltage ac transmission. The system is in place at the Bonneville Power Administration (BPA) Tacoma Substation and was in an experimental use for over a year. Extended operations of the unit were undertaken with success. The physical, electrical, and operational features of the SMES system are given. DOE

N84-29087*# RCA Solid State Technology Center, Somerville, N. J.
CHARACTERIZATION OF SILICON-GATE CMOS/SOS INTEGRATED CIRCUITS PROCESSED WITH ION IMPLANTATION Final Report, 1 Sep. 1979 - 1 Sep. 1980
D. S. Woo Jan. 1982 18 p ref
(Contract NAS8-31986)
(NASA-CR-161988; NAS 1.26:161988; RCA-PRRL-81-CR-19) Avail: NTIS HC A02/MF A01 CSCL 09A

The procedure used to generate MEBES masks and produce test wafers from the 10X Mann 1600 Pattern Generator Tape using existing CAD utility programs and the MEBES machine in the RCA Solid State Technology Center are described. The test vehicle used is the MSFC-designed SC102 Solar House Timing Circuit. When transforming the Mann 1600 tapes into MEBES tapes, extreme care is required in order to obtain accurate minimum linewidths when working with two different coding systems because the minimum grid sizes may be different for the two systems. The minimum grid sizes are 0.025 mil for MSFC Mann 1600 and 0.02 mil for MEBES. Some snapping to the next grid is therefore inevitable, and the results of this snapping effect are significant when submicron lines are present. However, no problem was noticed in the SC102 circuit because its minimum linewidth is 0.3 mil (7.6 microns). MEBES masks were fabricated and wafers were processed using the silicon-gate CMOS/SOS and aluminum-gate COS/MOS processing. Author

N84-29088*# Union Carbide Corp., Greenville, S.C. Components Dept.
TESTING AND FAILURE ANALYSIS TO IMPROVE SCREENING TECHNIQUES FOR HERMETICALLY SEALED METALLIZED FILM CAPACITORS FOR LOW ENERGY APPLICATIONS Final Report
Jul. 1982 62 p refs
(Contract NAS8-33957)

(NASA-CR-162071; NAS 1.26:162071) Avail: NTIS HC A04/MF A01 CSCL 09C

Effective screening techniques are evaluated for detecting insulation resistance degradation and failure in hermetically sealed metallized film capacitors used in applications where low capacitor voltage and energy levels are common to the circuitry. A special test and monitoring system capable of rapidly scanning all test capacitors and recording faults and/or failures is examined. Tests include temperature cycling and storage as well as low, medium, and high voltage life tests. Polysulfone film capacitors are more heat stable and reliable than polycarbonate film units. M.A.C.

N84-29089*# Mississippi State Univ., Mississippi State. Microelectronics Research Lab.

HIGH DENSITY CIRCUIT TECHNOLOGY Final Contract Report

Thomas E. Wade Mar. 1982 160 p

(Contract NAS8-33448)

(NASA-CR-162039; NAS 1.26:162039) Avail: NTIS HC A08/MF A01 CSCL 09C

A multilevel metal interconnection system for very large scale integration (VLSI) systems utilizing polyimides as the interlayer dielectric material is described. A complete characterization of polyimide materials is given as well as experimental methods accomplished using a double level metal test pattern. A low temperature, double exposure polyimide patterning procedure is also presented. R.S.F.

N84-29090*# Mississippi State Univ., Mississippi State. Microelectronics Research Lab.

HIGH DENSITY CIRCUIT TECHNOLOGY, PART 3 Final Report

Thomas E. Wade Mar. 1982 142 p refs

(Contract NAS8-33448)

(NASA-CR-162040; NAS 1.26:162040; MSSU-EIRS-EE-82-2-Pt-3) Avail: NTIS HC A07/MF A01 CSCL 09C

Dry processing - both etching and deposition - and present/future trends in semiconductor technology are discussed. In addition to a description of the basic apparatus, terminology, advantages, glow discharge phenomena, gas-surface chemistries, and key operational parameters for both dry etching and plasma deposition processes, a comprehensive survey of dry processing equipment (via vendor listing) is also included. The following topics are also discussed: fine-line photolithography, low-temperature processing, packaging for dense VLSI die, the role of integrated optics, and VLSI and technology innovations. R.J.F.

N84-29091*# Mississippi State Univ., Mississippi State. Microelectronics Research Lab.

HIGH DENSITY CIRCUIT TECHNOLOGY Final Contract Report

Thomas E. Wade Mar. 1982 154 p

(Contract NAS8-33448)

(NASA-CR-162041; NAS 1.26:162041) Avail: NTIS HC A08/MF A01 CSCL 09C

An accurate study and evaluation of dielectric thin films is conducted in order to find the material or combination of materials which would optimize NASA'S double layer metal process. Emphasis is placed on polyimide dielectrics because of their reported outstanding dielectric characteristics (including electrical, chemical, thermal, and mechanical) and ease of processing, as well as their rapid acceptance by the semiconductor industry. M.A.C.

N84-29092*# General Electric Co., Schenectady, N. Y. Signal Electronics Lab.

IMPROVED CHARGE INJECTION DEVICE AND A FOCAL PLANE INTERFACE ELECTRONICS BOARD FOR STELLAR TRACKING Final Technical Report, 17 Aug. 1982 - 31 Jan. 1984

G. J. Michon and H. K. Burke Jan. 1984 64 p refs

(Contract NAS8-34644)

(NASA-CR-171066; NAS 1.26:171066) Avail: NTIS HC A04/MF A01 CSCL 09C

An improved Charge Injection Device (CID) stellar tracking sensor and an operating sensor in a control/readout electronics board were developed. The sensor consists of a shift register scanned, 256x256 CID array organized for readout of 4x4 subarrays. The 4x4 subarrays can be positioned anywhere within the 256x256 array with a 2 pixel resolution. This allows continuous tracking of a number of stars simultaneously since nine pixels (3x3) centered on any star can always be read out. Organization and operation of this sensor and the improvements in design and semiconductor processing are described. A hermetic package incorporating an internal thermoelectric cooler assembled using low temperature solders was developed. The electronics board, which contains the sensor drivers, amplifiers, sample hold circuits, multiplexer, analog to digital converter, and the sensor temperature control circuits, is also described. Packaged sensors were evaluated for readout efficiency, spectral quantum efficiency, temporal noise, fixed pattern noise, and dark current. Eight sensors along with two tracker electronics boards were completed, evaluated, and delivered. Author

N84-29093*# Omni Technology, Freemont, Calif.

DEVELOPMENT OF STANDARDIZED SPECIFICATIONS FOR SCREENING SPACE LEVEL INTEGRATED CIRCUITS AND SEMICONDUCTORS Final Report

11 Jul. 1984 41 p refs

(Contract NAS8-35823)

(NASA-CR-171100; NAS 1.26:171100) Avail: NTIS HC A03/MF A01 CSCL 09C

Standardized methods are established for screening of JAN B microcircuits and JANTXV semiconductor components for space mission or other critical applications when JAN S devices are not available. General specifications are provided which outline the DPA (destructive physical analysis), environmental, electrical, and data requirements for screening of various component technologies. This standard was developed for Air Force Space Division, and is available for use by other DOD agencies, NASA, and space systems contractors for establishing common screening methods for electronic components. M.G.

N84-29094*# Mississippi State Univ., Mississippi State. Microelectronics Research Lab.

HIGH DENSITY CIRCUIT TECHNOLOGY, PART 1 Final Report, Jul. 1980 - Mar. 1982

Thomas E. Wade 1982 90 p refs

(Contract NAS8-33448)

(NASA-CR-162008; NAS 1.26:162008) Avail: NTIS HC A05/MF A01 CSCL 09C

The metal (or dielectric) lift-off processes used in the semiconductor industry to fabricate high density very large scale integration (VLSI) systems were reviewed. The lift-off process consists of depositing the light-sensitive material onto the wafer and patterning first in such a manner as to form a stencil for the interconnection material. Then the interconnection layer is deposited and unwanted areas are lifted off by removing the underlying stencil. Several of these lift-off techniques were examined experimentally. The use of an auxiliary layer of polyimide to form a lift-off stencil offers considerable promise. R.S.F.

N84-29095*# National Aeronautics and Space Administration, Washington, D. C.

STABILIZED LUMINOUS ARCS (ROTATING ARCS) IN NITROGEN AND CARBON DIOXIDE AT PRESSURES OF ONE TO FORTY ATMOSPHERES

Rudolf Foitzik Aug. 1984 58 p refs Transl. into ENGLISH of 'Untersuchungen am Stabilisierten Elektrischen Lichtbogen (Waelzbogen) in Stickstoff and Kohlensaeure bei Druecken von 1 bis 40 at" Wissenschatliche Veroffentlichugen aus dem Siemens-Werken, vol. 19, no. 1940 p 28-58 Transl. by Scientific Translation, Inc., Santa Barbara, Calif.

(Contract NASw-3542)

(NASA-TM-77506; NAS 1.15:77506) Avail: NTIS HC A04/MF A01 CSCL 20C

The arcs were run in the axis of a rapidly rotating glass tube, at 1 to 20 atm. For pressures over 20 atm., a decrease of stability

appeared and above 40 atm., the results were very unsatisfactory owing to turbulence. The voltage and longitudinal-field-strength curves for both gases had a descending character. The field strength was 1.5 to 2.0 times as high in CO2 as in N. Under 10 atm. of pressure approx. linear values obtained. In N the column diam. increased with pressure. C. d. increased with pressure in CO2. Good agreement with the Steenbeck minimum principle was in general obtained. Author

N84-29096# Illinois Univ., Urbana. Coordinated Science Lab.
HIGH SPEED FETs FABRICATED IN GaAs/AlGaAs LAYERED STRUCTURES PREPARED BY MOLECULAR BEAM EPITAXY Annual Progress Report, 31 Dec. 1982 - 31 Dec. 1983
H. Morkoc Jan. 1984 111 p
(Contract F49620-83-K-0021)
(AD-A141058; AFOSR-84-0404TR) Avail: NTIS HC A06/MF A01 CSCL 09/1

The research on modulation doped AlGaAs/GaAs FETs (MODFETs) and on AlGaAs buffer GaAs MESFETs has continued with substantial progress. Current-voltage collapse observed in the drain characteristics of MODFETs in dark at 77K have for the first time been eliminated. The responsible mechanisms were found to relate to the defect concentration in AlGaAs and also to the gate recess width relative to the gate. Microwave S-parameter measurements were also made to deduce the device equivalent circuit parameters and compared to conventional GaAs MESFETs. The results are compared qualitatively to predictions. In GaAs FETs with high resistivity AlGaAs buffer layers it was found that no improvement (relative to GaAs buffer FETs) but degradation can result if the AlGaAs buffer GaAs active layer interface is not of high quality. The only way high quality can be assured has been found to be via the use of a thin superlattice at the heterointerface. Both optical and electrical properties of the GaAs layer grown on this superlattice are of sufficiently high quality to lead the expected improvements in the device performance. With the super lattice AlGaAs/GaAs MESFETs better RF performance has been obtained. GRA

N84-29097# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HIGH-VOLTAGE SPARK GAP
V. N. Bondaletov and R. I. Golitsyn 4 May 1984 7 p Transl. into ENGLISH from Russian Patent, no. 347849 (10 Aug. 1972) p 1-3
(AD-A141072; FTD-ID(RS)T-1775-83) Copyright. Avail: NTIS HC A02/MF A01 CSCL 09/1

The inductive active resistance of the discharge circuit and is decreased and its reliability increased. This achievement was accomplished by making the basic discharge electrodes in the form of plane-parallel buses, and the surface of the ignition electrodes in a toothed form, which furthers the sharp distortion of the field between the main electrodes which feed to the ignition electrode of initiating voltage and development of parallel discharges from the teeth. B.G.

N84-29098# Polytechnic Inst. of New York, Brooklyn.
ANALYSIS OF NONUNIFORM DIELECTRIC WAVEGUIDES FOR MILLIMETER-WAVE APPLICATIONS Final Report, 25 Jan. - 1 Sep. 1983
S. T. Peng Apr. 1984 8 p
(Contract DAAG29-83-K-0006)
(AD-A141406; ARO-19506.1-EL) Avail: NTIS HC A02/MF A01 CSCL 09/1

Research described here is a three-year research program on the scattering of guided waves by open nonuniform dielectric waveguides, with a particular emphasis on those structures of practical interest. The main objectives of this research program are: (1) to identify all possible physical processes and to estimate their magnitudes, (2) to understand the physical processes and to assess their practical implications, and (3) to determine parametric dependences of important physical processes and to devise methods for controlling them. Author (GRA)

N84-29099# California Univ., Santa Barbara. Dept. of Physics.
AIR AS AN ADJUSTABLE INSULATOR FOR C-V AND G-V ANALYSIS OF SEMICONDUCTOR SURFACES
J. Moreland, J. Drucker, P. K. Hansma, J. P. Kotthaus, and A. Adams May 1984 14 p
(Contract N00014-78-C-0011)
(AD-A141437; TR-17) Avail: NTIS HC A02/MF A01 CSCL 09/1

An adjustable metal-air-semiconductor capacitor was fabricated using a Pb disk suspended 1700 - 3600 A above an n-type <111> surface. Experimental differential capacitance versus voltage and differential conductance versus voltage curves are similar to those previously obtained for metal-oxide-semiconductor capacitors. Author (GRA)

N84-29100# Texas Technological Univ., Lubbock. Inst. for Electronic Science.
REVIEW OF RESEARCH UNDER THE JOINT SERVICES ELECTRONICS PROGRAM Annual Report, for 1 Dec. 1982 - 1 Dec. 1983
L. R. Hunt, R. Su, T. G. Newman, E. Emre, and F. Lombardi Dec. 1983 162 p
(Contract N00014-76-C-1136)
(AD-A141458) Avail: NTIS HC A08/MF A01 CSCL 09/3

This report represents the seventh year of research under the auspices of the Joint Services Electronics Program at Texas Tech University. The program is in the area of information electronics and includes faculty from Computer Science, Electrical Engineering, and Mathematics. Specific work units deal with nonlinear control, parametric and nonparametric identification, pattern recognition for imaging systems, parallel computation and scheduling theory, analysis and design of large scale computing systems. The following items are provided for each work unit; a summary of the research performed in 1983, a list of publications and activities, and abstracts of published and pending papers. This annual report also contains lists of all grants and contracts administered by JSEP personnel and of all grants and contracts in the Departments of Electrical Engineering/Computer Science and Mathematics. Author (GRA)

N84-29101# California Univ., Berkeley. Electronics Research Lab.
RESEARCH IN COMPUTER SIMULATION OF INTEGRATED CIRCUITS Final Report, 1 Oct. 1981 - 31 Jul. 1983
A. R. Newton and D. O. Pdederson 31 Jul. 1983 43 p
(Grant AF-AFOSR-0021-82; AF Proj. 2305)
(AD-A141855; AFOSR-84-0447TR) Avail: NTIS HC A03/MF A01 CSCL 09/5

The performance of the new LSI simulator CLASSIE is evaluated on several circuits with a few hundred to over one thousand semiconductor devices. A more accurate run time prediction formula has been found to be appropriate for circuit simulators. The design decisions for optimal performance under the constraints of the hardware (CRAY-1) are presented. Vector computers have an increased potential for fast, accurate simulation at the transistor level of Large-Scale-Integrated Circuits. Design considerations for a new circuit simulator are developed based on the specifics of the vector computer architecture and of LSI circuits. The simulation of Large-Scale-Integrated (LSI) circuits requires very long run time on conventional circuit analysis programs such as SPICE2 and super-mini computers. A new simulator for LSI circuits, CLASSIE, which takes advantage of circuit hierarchy and repetitiveness, and array processors capable of high-speed floating-point computation are a promising combination. While a large number of powerful design verfication tools have been developed for IC design at the transistor and logic gate levels, there are very few silicon-oriented tools for architectural design and evaluation. GRA

N84-29102# Hughes Research Labs., Malibu, Calif.
DESIGN STUDY OF FLOATING POINT SYSTOLIC VLSI CHIP Final Report
J. G. Nash and G. R. Nudd Mar. 1984 117 p

(Contract N66001-82-M-4120; XR0-2102)
(AD-A141868; NOSC/CR-232) Avail: NTIS HC A06/MF A01 CSCL 09/5

The objective of this program was to investigate the feasibility of building a floating point processor (24-bit mantissa and 8-bit exponent) on a single ship based on the Hughes Research Laboratories (HRL) present 28-bit fixed point chip (Multiplication Oriented Processor or MOP chip). The plan was to generate any necessary cell logic, layout, or simulations in order to estimate the size of the chip and predict its performance. Since division and square root were not included in the HRL MOP chip, arithmetic algorithms for performing these operations were to be studied.
Author (GRA)

N84-29103# Princeton Univ., N. J. Dept. of Electrical Engineering and Computer Science.
RESEARCH INTO SELF-TIMED VLSI CIRCUITS Semiannual Report
R. J. Lipton 26 Mar. 1984 86 p
(Contract N00014-82-K-0549)
(AD-A141871) Avail: NTIS HC A05/MF A01 CSCL 09/3

There are three major components to our project. The first is in the area of procedural design of VLSI circuits. The second is in the area of our census language, and the third is in the area of the testing of VLSI circuits.
Author (GRA)

N84-29104# Rome Air Development Center, Griffiss AFB, N.Y.
PROCEEDINGS OF THE ANTENNA APPLICATIONS SYMPOSIUM, VOLUME 1
Mar. 1984 263 p Symp. held at Monticello, Ill., 21-23 Sep. 1983 (AF Proj. 4600)
(AD-A142003; RADC-TR-84-52-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 09/5

The Proceedings of the 1983 Antenna Applications Symposium is a collection of the State-of-the-Art papers relating to Phased Array Antennas, Millimeter Wave Antennas, Microstrip and Conformal Antennas and Reflector Antennas. For individual titles, see N84-29105 through N84-29117.

N84-29105# Rome Air Development Center, Griffiss AFB, N.Y.
ANTENNA APPLICATIONS AND SYSTEM ENGINEERING c32
F. I. Diamond *In its* Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 13-15 (For primary document see N84-29104 19-33)
(AD-P003401) Avail: NTIS HC A12/MF A01 CSCL 09/5

Currently, the Rome Air Development Center is involved in radar and communications developments for spaceborne, airborne and ground platforms. In spaceborne applications, the need for radars with high power-aperture products and communications satellites with large amounts of effective radiated power promote consideration of very large apertures with dimensions in the order of hundreds of wavelengths. Radar requirements of accuracy and resolution and communications needs for very high data rates imply greater bandwidths. The need for broad radar coverage and multiple target tracking and communications needs for diversity, coverage, and multiple accesses give rise to consideration of greater beam agility. Size and weight are important for spaceborne and airborne applications; but mobility requirements for tactical radar and communications make this essential consideration for ground-based applications. Concerns over electronics counter measures impose further requirements such as ultra-low sidelobes, adaptive nulling, and wide band signals. Needless to say, low-cost and reliability are the important design factors, too. GRA

N84-29106# Ball Aerospace Systems Div., Boulder, Colo.
FUNDAMENTAL DESIGN ISSUES FOR MONOLITHIC PHASED ARRAYS c32
R. J. Stockton *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 17-38 (For primary document see N84-29104 19-33)
(AD-P003402) Avail: NTIS HC A12/MF A01 CSCL 09/5

Basic design issues associated with the monolithic implementation of microwave and millimeter-wave active aperture, conformal, phased array antenna systems are presented. Since the planar surface area is limited and large regions must be set aside as unused exclusion zones to prevent mutual coupling, fitting all of the essential components such as phase shifters, amplifiers and a feed network within the available inter-element area is extremely difficult. Electrical, thermal and mechanical tradeoffs related to monolithic subarray technology are described in detail.
Author (GRA)

N84-29107# General Electric Co., Syracuse, N.Y. Electronics Lab.
INTEGRATION OF MONOLITHIC MICROWAVE INTEGRATED CIRCUITS INTO PHASED ARRAY ANTENNA SYSTEMS
B. J. Edward *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 39-64 (For primary document see N84-29104 19-33)
(AD-P003403) Avail: NTIS HC A12/MF A01 CSCL 09/5

Monolithic Microwave Integrated Circuit (MMIC) technology will have a dramatic impact upon future radar, electronic warfare, and communication systems which utilize phased arrays. Systems in both the commercial and defense industries which require large quantities of densely packed circuitry will become the prime benefactors of MMIC technology. The microwave and antenna engineers responsible for the integration of MMICs into these new systems must develop compatible radiating elements, feed networks, and module configurations as well as techniques for satisfying electrical, mechanical, and thermal interfaces in the array. This paper discusses techniques that have been developed for interfacing MMIC modules to phased array systems. Radiating elements suitable for integration with monolithic circuitry including some novel implementations of classic radiators are presented. Examples of monolithic circuits as well as mounting and packaging methods for complete transmit/receive modules are given.
Author (GRA)

N84-29108# Sanders Associates, Inc., Nashua, N. H. Antennas and RF Systems Dept.
A WIDE BAND 44 GHz PRINTED CIRCUIT CONFORMAL ARRAY c32
D. F. Sedivec and B. F. Hubin *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 65-98 (For primary document see N84-29104 19-33)
(AD-P003404) Avail: NTIS HC A12/MF A01 CSCL 09/5

A 16-element printed circuit array in four by four configuration was designed, developed, and tested at 44 GHz using stripline techniques. The array incorporated the Sanders wide band Tee-Fed Slot element with integral corporate power divider, and produced a well defined main beam in a broadside direction with sidelobes -16 dB or better from 43 to 45 GHz. The VSWR was measured to be less than 2:1 over the band and the gain measured at 17 dBi. Extended measurements of VSWR, E & H Plane patterns, and gain from 41 to 48 GHz showed VSWR no greater than 2.5:1 and gain to be no less than 16 dBi, with reasonable radiation patterns. The development methodology was to design, test, and evaluate all components and the array at 11 GHz and scale by four to 44 GHz taking into account the errors introduced by transmission line surface finish and dielectric properties. This procedure, together with well controlled fabrication techniques, yielded an array extremely high frequency whose electrical characteristics were nearly identical to those of the Super High Frequency array.
Author (GRA)

N84-29109# Westinghouse Electric Corp., Baltimore, Md.
DEVELOPMENT OF SCANNING DIPOLE ARRAY
D. Davis, G. E. Evans, V. L. Fisher, and A. H. Johnson *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 99-118 (For primary document see N84-29104 19-33)
(AD-P003405) Avail: NTIS HC A12/MF A01 CSCL 09/5

A dipole was recently developed for use in a phased array at 420 to 450 MHz. It was designed to scan + or - 40 degrees in elevation and + or - 48 degrees in azimuth. The data presented includes analytical simulation, VSWR testing of the dipole both isolated and in simulators, and patterns measured with a finite array. The simulators include single and dual mode devices as well as two 11-element columns. The extensive simulator work

was necessary partially because of the small size of the array. The columns were used in conjunction with computer analyses to determine VSWR throughout the scanning coverage. The data from various sources agrees well, and predicts that the VSWR across the frequency band across all scan angles will be less than 1.9:1. Author (GRA)

N84-29110# Harris Corp., Melbourne, Fla. Government Data Communications Div.

THE DESIGN OF A LOW LOSS LIGHT-WEIGHT S-BAND PHASE SHIFTER

C. A. Hancik, N. Moldovan, and D. E. Heckaman *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 119-134 (For primary document see N84-29104 19-33)

(AD-P003406) Avail: NTIS HC A12/MF A01 CSCL 09/5

This paper discusses the design and fabrication of a low loss, light-weight 4 bit phase shifter for use in airborne phased array antenna applications. The phase shifter operates over the 2.2 to 2.3 GHz frequency band with a maximum average insertion loss of 1.0 dB over the 16 possible states. It dissipates less than 30 mW power. The entire assembly consists of four levels of circuitry packaged into a right circular cylinder weighing 1.2 ounces and measuring 2.80 inches (outer diameter) and .75 inches thick. Novel packaging techniques resulted in the use of a one layer, thin (.002 inch), flexible circuit, folded between ground planes and low loss dielectric spacers. The use of one flexible circuit allowed all circuit metallization and RF interconnecting to be done simultaneously during the printing and etching fabrication process. Author (GRA)

N84-29111# Sperry Rand Corp., Great Neck, N. Y. Defense Electronics Unit.

A COMPACT FULLY OVERLAPPING SUBARRAY ANTENNA c32

P. A. Valentino, J. J. Stangel, and S. Milazzo *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 135-164 (For primary document see N84-29104 19-33)

(Contract F19628-81-C-0078)

(AD-P003407) Avail: NTIS HC A12/MF A01 CSCL 09/5

This paper describes a new limited scan antenna technique for electronic scanning arrays. The antenna uses a novel coupling network to achieve fully overlapping subarrays with minimal antenna depth. The coupling network is comprised of contraposed input and output ports interconnected through a one wavelength section of radial waveguide. Antenna and network design principles are discussed in detail. Performance parameters are defined and the major features of the design including very low sidelobe and adaptive nulling capabilities are presented. An experimental demonstration antenna is described, and experimental results for the antenna and coupling network demonstrating the capabilities of the design are presented. Author (GRA)

N84-29112# Lockheed Electronics Co., Plainfield, N. J.

GEODESIC CONE ANTENNA c32

B. S. Cramer *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 165-189 (For primary document see N84-29104 19-33)

(AD-P003408) Avail: NTIS HC A12/MF A01 CSCL 09/5

The subject of this paper is a novel phased array antenna which is capable of providing 360 degree continuous scanning with low side lobes over a wide band. The antenna consists of a ring of feed elements coupling energy through a coaxial conical waveguide to a circular radiating aperture. Rays from the feed ring are constrained within the conical coaxial waveguide and propagate along geodesic paths in such a way as to be focused in the far field. A paper presenting a preliminary design of a Geodesic Lens Antenna was presented at this symposium in 1981. Since that time, evaluation has shown performance equivalent to a linear aperture illuminated with a Tchebyshev distribution. Progress achieved in computer aided design and analysis allows tailoring a Geodesic Cone Antenna to the specific needs and constraints of given applications. A brief explanation of the function of the Geodesic Cone Waveguide using geometric optics is presented. Design and analysis techniques utilizing geometric optics and modal analysis are described. A half octave demonstration model of a Geodesic cone Antenna has been built and tested and showed good correspondence with predicted performance. Author (GRA)

N84-29113# Harris Corp., Melbourne, Fla. Government Data Communications Div.

THE MECHANICAL DESIGN OF A HIGH-POWER, DUAL FREQUENCY, MILLIMETER-WAVE ANTENNA FEED SYSTEM

N. Moldovan *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 191-206 (For primary document see N84-29104 19-33)

(AD-P003409) Avail: NTIS HC A12/MF A01 CSCL 09/5

This paper describes the mechanical design and fabrication of a high power, dual-frequency, millimeter-wave feed system. The feed system consists of a 35 GHz circularly polarized monopulse subsystem and a 95 GHz circularly polarized feed. The 35 GHz feed is designed to handle 5.0 kW average and 50 kW peak power and the 95 GHz 1.2 kW average and 12 kW peak power. A Frequency Selective Surface (FSS) is incorporated to provide dual frequency capability. Each feed is liquid cooled to provide suitable cooling during high power operation. The two feeds and FSS assembly are mounted in a supporting space frame to provide an optically integral assembly ready to be mounted at the vertex of a reflector. The paper addresses three main areas: the general feed design, which includes the manufacturing processes, flange considerations and waveguide cooling; the FSS fabrication; and beam alignment for both the primary and secondary field. Author (GRA)

N84-29114# Lincoln Lab., Mass. Inst. of Tech., Lexington.

EARTH COVERAGE CORRUGATED HORNS (44.5 GHz AND 20.7 GHz) c32

D. C. Weikle *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 207-225 (For primary document see N84-29104 19-33)

(AD-P003410) Avail: NTIS HC A12/MF A01 CSCL 09/5

Communications satellites located in geosynchronous orbits will, in addition to more specialized shaped beam or area coverage antennas, generally utilize Earth coverage antennas designed to maximize antenna gain over the entire surface of the visible Earth. In the microwave and millimeter wave bands, these antennas are usually conical horns which achieve a minimum gain of 17 - 17.5 dBi at the limb of the Earth. This paper describes the design of a single mode Earth coverage horn that optimizes minimum gain. Measurements performed over a 5% frequency band on experimental models designed to operate at 20.7 GHz and 44.5 GHz demonstrate a minimum gain 17.8 dBi. Other characteristics of the horns are circularly symmetric radiation patterns, low VSWR (1.2), and peak gain of approximately 22.0 dBi. Author (GRA)

N84-29115# Texas Instruments, Inc., Dallas.

ADVANCES IN SPIRAL ANTENNA TECHNOLOGY

P. B. Green *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 227-248 (For primary document see N84-29104 19-33)

(AD-P003411) Avail: NTIS HC A12/MF A01 CSCL 09/5

Most of the development of the spiral antenna was completed in the fifties and sixties. Efforts in the last decade have concentrated on technology refinement. This paper summarizes some of the more important, but less heralded, advances in spiral antenna technology - concentrating on hybrid spiral structures, utilization of advanced microwave absorbers, upper-frequency extension, and low-cost production techniques. Author (GRA)

N84-29116# Raytheon Co., Goleta, Calif. Electromagnetic Systems Div.

DESIGNING ANTENNAS TO PRICE; OR THE ECONOMICS OF ANTENNA DESIGN

G. J. Monser *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 249-254 (For primary document see N84-29104

19-33)
(AD-P003412) Avail: NTIS HC A12/MF A01 CSCL 09/5

The paper highlights, by example, trade-offs leading to a cost-effective design of antennas. Parameters and tolerance for cost versus machined array elements are discussed leading to a projected production cost of under $50.00 per array element.
Author (GRA)

N84-29117# Norden Systems, Inc., Norwalk, Conn.
REBUTTAL TO FLOATING A SATELLITE ON MICROWAVES
H. Shnitkin *In* RADC Proc. of the Antenna Appl. Symp., Vol. 1 Mar. 1984 p 255-265 (For primary document see N84-29104 19-33)
(AD-P003413) Avail: NTIS HC A12/MF A01 CSCL 09/5

Earlier this year, the author came across an interesting article appearing in the Electronic Engineering Times entitled: Floating a Satellite on Microwaves Advanced by Stanford Research. That article discusses a scheme of floating a passive microwave reflector about 100 miles above the surface of the Earth by means of microwaves radiated from the ground. The reflector is to bounce microwave signals between two points, 1000 miles apart, for communication purposes. The satellites is claimed to measure about 30 feet in diameter, weigh less than one-tenth of a gram, and operate between 500 KHz and 10 GHz. This proposed space mirror, which is hoped to become a low-cost alternative to the complex communications satellites now orbited, has been examined in greater detail, resulting in a number of technical disagreements between the author and the proponents of the space mirror. The body of this paper is a rebuttal of the technical claims for the performance of the space mirror made in the referenced article. Counter arguments are presented in the areas of transmitted power, radiation hazard, structural stability tolerance, and skin depth.
Author (GRA)

N84-29118# McGraw-Edison Co., St. Louis, Mo.
SOLID STATE POWER CONTROLLER FUSE DEVELOPMENT PROGRAM Final Report, Aug. 1981 - Jul. 1983
V. R. Spauhorst, W. H. Curtis, and V. Kalra Wright-Patterson AFB, Ohio AFWAL 1 Oct. 1983 294 p
(Contract F33615-81-C-2052)
(AD-A142118; AFWAL-TR-83-2070) Avail: NTIS HC A13/MF A01 CSCL 10/2

The purpose of this development program is to design a family of fail-safe fuses (2-30A, 28VDC, 115/230V-400 Hz) for applications in aircraft electrical systems solid state power controllers (SSPCs). The SSPC functions as a circuit interrupter and a load controller, and when operating properly should protect the aircraft wiring between itself and the load. However, if the SSPC fails to open during a short or overload condition, excessive current can flow, resulting in serious damage to aircraft wiring. The purpose of the SSPC fuse is to prevent wire damage in this double fault condition.
Author (GRA)

N84-29119# California Univ., Berkeley.
VLSI RESEARCH Semiannual Technical Research and Development Status Report, Oct. 1983 - Apr. 1984
R. W. Brodersen Apr. 1984 1547 p
(Contract N00039-C-80-0107; ARPA Order 4031)
(AD-A142142) Avail: NTIS HC A23/MF A01 CSCL 09/5

A scaled version of the RISC II chip has been fabricated and tested and these new chips have a cycle time that would outperform a VAX 11/780 by about a factor of two on compiled integer C programs. The architectural work on a RISC chip designed for a Smalltalk implementation has been completed. This chip, called SOAR (Smalltalk On a RISC), should run program s4-15 times faster than the Xerox 1100 (Dolphin), a TTL minicomputer, and about as fast as the Xerox 1132 (Dorado), a $100,000 ECL minicomputer. The 1983 VLSI tools tape has been converted for use under the latest UNIX release (4.2). The Magic (formerly called Caddy) layout system will be a unified set of highly automated tools that cover all aspects of the layout process, including stretching, compaction, tiling and routing. A multiple window package and design rule checker for this system have just been completed and compaction and stretching are partially implemented. New slope-based timing models for the Crystal timing analyzer are now fully implemented and in regular use. In an accuracy test using a dozen critical paths from the RISC II processor and cache chips it was found that Crystal's estimates were within 5-10% of SPICE's estimates, while being a factor of 10,000 times faster.
Author (GRA)

N84-29120# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
PROCEDURES FOR SIGNAL RECONSTRUCTION FROM NOISY PHASE
D. M. Thomas and M. H. Hayes 1984 5 p
(Contract DAAG29-81-K-0024; AF Proj. 2304)
(AD-A142185; AFOSR-84-0349TR) Avail: NTIS HC A02/MF A01 CSCL 09/4

In this paper a class of iterative procedures is presented for reconstructing a finite duration sequence from noisy samples of its Fourier transform phase. These measurement are combined with a knowledge of the true transform magnitude and/or hard constraints on the phase noise variations to define sets whose intersection must contain the true sequence. The algorithms iterate between the sequence domain and the transform domain applying the known constraints (i.e., finite duration and known limits on phase variation) in each domain. Results of an experimental investigation are presented. A method is described for the case where limits on both the magnitude and phase variation of a finite length sequence are known.
Author (GRA)

N84-29121# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
THE ROLE OF BOUNDARY LAYER CAPACITANCE AT BLOCKING ELECTRODES IN THE INTERPRETATION OF DIELECTRIC CURE DATA IN ADHESIVES Technical Report, Jun. 1983 - May 1984
D. R. Day, T. J. Lewis, H. L. Lee, and S. D. Senturia 31 May 1984 24 p
(Contract N00014-78-C-0591)
(AD-A142188; TR-8) Avail: NTIS HC A02/MF A01 CSCL 13/8

The use of dielectric measurement techniques for monitoring the cure of adhesives and matrix resins used in composite materials is well known. Either parallel-plate electrodes or recently introduced dielectric microsensors can be used. During a typical cure, the quantitative results obtained from dielectric measurements early in cure, where the resin is a viscous liquid, have been shown to depend on the presence or absence of blocking layers at one or both electrodes. This paper reports a quantitative evaluation of the effects of blocking layers on the interpretation of such dielectric data. The approach follows that used for dilute electrolytes, which is a reasonable model for the liquid resins, in which ion conduction will always be present to some degree. It is shown, first, that blocking layers can be modeled as capacitances in series with the bulk adhesive; second, that when the dielectric loss factor of the material is high (which is typically true early in cure), the apparent dielectric response is dominated by the charging and discharging of boundary layer capacitance through the bulk resistance of the sample; and, third, that this phenomenon leads to behavior that is similar to a Debye model for dipole orientation, but with an apparent permittivity (dielectric constant) that is inversely proportional to the boundary layer thickness.
GRA

N84-29122# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
AN ITERATIVE METHOD FOR RESTORING NOISY BLURRED IMAGES
A. K. Katsaggelos, J. Biemond, R. M. Mersereau, and R. W. Schafer 1984 5 p
(Contract DAAG29-81-K-0024; AF Proj. 2304)
(AD-A142201; AFOSR-84-0353TR) Avail: NTIS HC A02/MF A01 CSCL 09/4

This paper introduces a new iterative image restoration method which is capable of restoring noisy, blurred images by incorporating a priori knowledge about the image and noise

statistics into the iterative procedure. The iteration equation consists of a prediction part which is based on a noncausal image model description and an innovation part which is weighted by a gain factor. The gain is computed using a linear MSE optimization procedure and is updated at each step of the iteration. This image restoration scheme can be interpreted as an iterative procedure with a statistical constraint on the image data. GRA

N84-29123# Department of the Army, Washington, D. C.
HIGH POWER OPTICAL SWITCH FOR MICROSECOND SWITCHING Patent Application
S. Levy, J. C. OConnell, W. H. Wright, Jr., and M. Weiner, inventors (to Army) Filed 17 May 1984 13 p
(AD-D011064; US-Patent-Appl-SN-611292) Avail: NTIS HC A02/MF A01 CSCL 09/5

High power optically activated switches of the semiconductor type utilizing a broadbanded flashlamp as the source of light for rendering the semiconductor conductive and thus close the switch. In order that the conductivity of the semiconductor when in the on state be uniform over the load current carrying cross-section thereof, the semiconductor is treated to produce a tapered density of trapping or re-combination centers therein, with the density being a maximum at the semiconductor surface which faces the flashlamp. Several novel configurations of these switches are shown, including reflectors for concentrating the flashlamp output on the semiconductor, and a plurality of semiconductor switches all activated by a single light source, as well as liquid cooled semiconductors. Author (GRA)

N84-29124# Department of the Navy, Washington, D. C.
MICROWAVE FREQUENCY DIVIDER Patent Application
C. Rauscher, inventor (to Navy) Filed 24 Apr. 1984 25 p
(AD-D011065; US-Patent-Appl-SN-603382) Avail: NTIS HC A02/MF A01 CSCL 09/5

A microwave frequency divider circuit is described. The frequency divider comprises a nonlinear amplifier including input and output ports for amplifying signals applied to the input port. The amplifier exhibits a nonlinear transconductance characteristic between its input and output ports. The amplifier input port is adaptable to receive a first signal having a frequency f1. The frequency divider further includes a feedback network coupled between the amplifier output and input ports to couple a second signal having a frequency fo appearing at the amplifier output port back to the input port. The first and second signal combine at the amplifier input port to modulate the nonlinear transconductance of the amplifier such that said first and second signals are mixed together and amplified. The circuit regeneratively oscillates such that the frequency fo equals a frequency f1/2. The frequency f1 of the first signal is thus divided by the circuit. Author (GRA)

N84-29125# Department of the Army, Washington, D. C.
SEMICONDUCTOR MULTIPACTOR DEVICE Patent Application
J. D. Evankow, Jr., inventor (to Army) Filed 21 May 1984 13 p
(AD-D011067; US-Patent-Appl-SN-612524) Avail: NTIS HC A02/MF A01 CSCL 09/1

The placement of one or a pair of suitably biased thin semiconductor epitaxial layers on the secondary emission surface of a multipactor device provides an improvement of devices which operate in accordance with the principle of multipactoring. A multipactor device is disclosed having a multipactor region comprised of at least one surface formed of one or more thin epitaxial semiconductor layers, the outer layer being of n-type semiconductor material consisting of, for example, gallium phosphide covered with cesium which provides an abundance of free electrons at the surface when biased in the forward direction. In one disclosed configuration the multipactor region is located in a section of waveguide while in another arrangement the region is located in a section of waveguide while in another arrangement the region is located on the top of a post in a multipactor input cavity. Author (GRA)

N84-29126# Department of the Navy, Washington, D. C.
FREQUENCY DOMAIN NON-LINEAR SIGNAL PROCESSING APPARATUS AND METHOD FOR DISCRIMINATION AGAINST NON-GAUSSIAN INTERFERENCE Patent Application
R. Dwyer, inventor (to Navy) Filed 28 Jun. 1983 23 p
(AD-D011068; US-Patent-Appl-SN-508649) Avail: NTIS HC A02/MF A01 CSCL 17/1

This document describes an apparatus and method for discriminating against non-Guassian noise. Analog signals from an array of sensors are converted to real and imaginary digital representations and processed such that non-Gaussian noise is separated from signals of interest. The processor uses estimates of Kurtosis and quantiles from either past or adjacent frequency components to construct non-linear elements, which are then used to process remaining signal data to improve the signal-to-noise ratio thereof by removing non-Gaussian noise therefrom. GRA

N84-29127# Department of the Navy, Washington, D. C.
ORGANIC SEMICONDUCTOR VAPOR SENSING METHOD Patent Application
H. Wohltjen, inventor (to Navy) 25 Apr. 1984 20 p
(AD-D011070; US-Patent-Appl-SN-603874) Avail: NTIS HC A02/MF A01 CSCL 09/1

This invention relates to vapor detection systems and particularly to methods and apparatus for temperature compensated vapor detection. An improved method and apparatus to automatically compensate for temperature variation in a vapor detection system is described. In one embodiment, two identical organic semiconductor film sensors in close thermal contact with each other are used in the feedback circuit of an inverting amplifier supplied by constant voltage. One of the sensors is isolated from vapor exposure to act as a reference for the other sensor which is used for vapor sampling. The output of the inverting amplifier provides an indication of the presence and relative concentration of vapor exposure. Variation in sample sensor resistance due to a change in temperature is accompanied by the same corresponding change in the reference sensor. GRA

N84-29128# Department of the Navy, Washington, D. C.
DEMOUNTABLE COAXIAL ELECTRICAL CONNECTOR FOR IN-LINE AMPLIFIERS Patent Application
R. J. Phillips, inventor (to Navy) Filed 17 Jan. 1984 9 p
(AD-D011074; US-Patent-Appl-SN-571414) Avail: NTIS HC A02/MF A01 CSCL 09/1

A flexible coaxial connector assembly is used on buoyant cable antenna systems. It comprises a retainer assembly that has threads mating with a bellows assembly. Components that mate in a flexible manner are enclosed by the bellows. An electrical wire passes through these flexible mating components and terminates in a contact pin. The contact pin mates with an amplifier contact socket assembly. Author (GRA)

N84-29129# Department of the Army, Washington, D. C.
MONOLITHIC AMPLIFIER Patent Application
R. S. Gilson and T. F. Burke, inventors (to Army) Filed 1 Jun. 1984 42 p
(AD-D011075; US-Patent-Appl-SN-616091) Avail: NTIS HC A03/MF A01 CSCL 09/5

An integrated amplifier circuit for monolithic fabrication is disclosed. The circuit includes a plurality of amplifier stages between an input transmission line and an output transmission line. Each stage includes a FET formed on the surface of a semi-insulating substrate such as gallium arsenide (GaAs). The gate of each FET is connected to the input transmission line, while the drain is connected to the output transmission line. The source is connected through the semi-insulating substrate to a conductive layer. A received signal propagates as a traveling wave along the input transmission line, and is amplified by each of the FETs. The phase delay between the gates is the same as that between the drains, so that the amplified signal adds constructively on the output transmission line. Each of the transmission lines is terminated in its own characteristic impedance, which may be equal to the load. Author (GRA)

N84-29130# Department of the Army, Washington, D. C.
RESONATOR INSENSITIVE TO PARAXIAL ACCELERATIONS Patent Application
M. Nakazawa and A. Ballato, inventors (to Army) Filed 19 Apr. 1984 10 p
(AD-D010998; US-Patent-Appl-SN-597326) Avail: NTIS HC A02/MF A01 CSCL 09/1

This document describes a ring-supported quartz crystal resonator having a circular peripheral which is configured in the form of a domed arch wherein the top and bottom surfaces thereof are, respectively, convex and concave. In one embodiment the radius of curvature of the convex and concave top and bottom surfaces are substantially equal so that an arch of substantially uniform thickness is provided. In a second embodiment, the convex and concave top and bottom surfaces have different radii of curvature and, more particularly, the radius of curvature of the top surface is less than the radius of curvature of the bottom surfaces whereby a thickness of the inner region gradually increases uniformly toward the center. Such structures exhibit low resistance and improved mode spectrum. Author (GRA)

N84-29131# Department of the Navy, Washington, D. C.
THREE DIMENSIONAL, ORTHOGONAL DELAY LINE BOOTLACE LENS ANTENNA Patent Application
P. A. Valentino, inventor (to Navy) Filed 16 Dec. 1983 16 p
(AD-D011020; US-Patent-Appl-SN-562336) Avail: NTIS HC A02/MF A01 CSCL 09/5

A bootlace microwave lens antenna has orthogonal delay lines for reducing quadratic phase errors to improve focusing capability. The collector and radiator elements consist of mutually orthogonal pairs of subelements with one of the subelements oriented radially and the other oriented tangentially on the respective collector and radiator surfaces. Individual delay lines interconnect corresponding radial and tangential subelements on each surface thus allowing for phase corrections in the axial planes parallel to and perpendicular to the plane of scan by the introduction of an appropriate phase delay in each delay line. Author (GRA)

N84-29132# Department of the Air Force, Washington, D.C.
HIGH POWER HIGH VOLTAGE LINEAR AMPLIFIER APPARATUS Patent Application
W. E. Milberger, inventor (to Air Force) Filed 7 Mar. 1984 15 p
(AD-D011028; US-Patent-Appl-SN-586955) Avail: NTIS HC A02/MF A01 CSCL 09/5

A high power, high voltage linear field effect transistor amplifier apparatus utilizing an automatic gate biasing network to normalize the gate threshold voltages of a plurality of field effect transistors which are in either series or parallel. Thus, these series or parallel combinations of field effect transistors may be operated as linear devices. A high-voltage, high power, wide-band carrier controlled linear amplifier is provided by utilizing an oscillator as a driver. Author (GRA)

N84-29133# Department of the Air Force, Washington, D.C.
NARROW DEVIATION VOLTAGE CONTROLLED CRYSTAL OSCILLATOR Patent Application
M. M. Driscoll, inventor (to Air Force) Filed 27 Jan. 1984 16 p
(AD-D011033; US-Patent-Appl-SN-574434) Avail: NTIS HC A02/MF A01 CSCL 09/5

It is therefore an object of the present invention to provide an improved narrow deviation voltage controlled crystal oscillator having an improved noise floor and output signal frequency stability. In the present invention, a composite resonator is used that is similar to the composite resonator used in U.S. Patent 4,134,085, but the resonator is not imbedded in the base circuit of the sustaining step transistor where it operates as a parallel resonant circuit. Instead it is placed in series with the emitter of the sustaining stage transistor where it operates as a series resonant circuit to provide an improved noise floor. Also, since the circuit disclosed herein does not require the use of the additional transforming circuitry or spurious suppression circuitry used in the oscillator circuit shown in U.S. Patent 3,571,754, its long term stability is greatly improved. GRA

N84-29134# Department of the Navy, Washington, D. C.
FAST TURN-ON OSMIUM COATED CATHODE Patent Application
C. R. K. Marrian, G. A. Haas, and A. Shih, inventors (to Navy) Filed 15 Mar. 1984 17 p
(AD-D011036; US-Patent-Appl-SN-589913) Avail: NTIS HC A02/MF A01 CSCL 09/1

This abstract discloses a fast turn-on refractory coated cathode comprising a porous tungsten metal matrix impregnated with barium calcium aluminate and coated with osmium. The osmium coating has a planned series of interruptions with each interruption being on the order of several microns in width to thereby expose the tungsten. These interruptions permit the barium and oxygen from the impregnant to rise to the cathode surface during activation or reactivation to form a desired near monolayer of barium and oxygen to enhance electron emission. Thus, this cathode design provides a fast turn-on characteristic even after shelf storage.Author (GRA)

N84-29135# Department of the Army, Washington, D. C.
METHOD OF MINIMIZING THE AGING RATE OF AN OSCILLATOR Patent Application
J. R. Vig, inventor (to Army) Filed 23 Apr. 1984 22 p
(AD-D011049; US-Patent-Appl-SN-603253) Avail: NTIS HC A02/MF A01 CSCL 09/5

The aging rate of an oscillator is minimized by applying a high drive current to the resonator early in the oscillators life until the aging rate decreases to a low value and then applying a low drive current to the resonator for the rest of the oscillators life at a constant temperature. Author (GRA)

N84-29136# General Electric Co., Schenectady, N. Y. Corp. Research and Development Center.
UTILIZATION OF AMORPHOUS METALS IN ELECTRIC MOTORS. POWER SYSTEMS TECHNOLOGY PROGRAM
L. A. Johnson Mar. 1984 121 p Prepared in cooperation with ORNL
(Contract DE-AC05-84OR-21400)
(DE84-009483; ORNL/Sub-81-70519-1) Avail: NTIS HC A06/MF A01

The objective of this work has been to establish the feasibility of producing amorphous metal in a form which could be utilized in a motor core at low cost while retaining its excellent magnetic properties. The approach taken was to develop a process for casting amorphous metal in the form of a continuous helical ribbon in order to avoid the necessity of handling individual laminations. A second objective was to either: (1) establish the feasibility of directly casting conductor slots in the amorphous metal ribbon, or (2) develop a means for rapid, inexpensive formation of the conductor slots after casting the helical ribbon. DOE

N84-29137# Sandia Labs., Albuquerque, N. Mex.
HIGH TEMPERATURE ELECTRICAL CONDUCTIVITY OF RIGID POLYURETHANE FOAM
Ralph T. Johnson, Jr. Mar. 1984 8 p refs
(Contract DE-AC04-76DP-00789)
(DE84-008699; SAND-84-0075) Avail: NTIS HC A02/MF A01

The temperature dependence of the electrical conductivity of three rigid polyurethane foams prepared using different formulations was measured to approx. 320 C. The materials exhibit similar conductivity characteristics, showing a pronounced increase in conductivity with increasing temperature. The insulating characteristics to approx. 200 C are better than that for phenolic materials (glass fabric reinforced), and are similar to those for silicone materials (glass microsphere reinforced). At higher temperatures (500 to 600 C), the phenolics and silicones are better insulators. DOE

N84-29138# Sandia Labs., Albuquerque, N. Mex.
LINEAR STABILITY OF GENERAL MAGNETICALLY INSULATED ELECTRON FLOW
J. A. Swegle, C. W. Mendel, Jr., D. B. Seidel, and J. P. Quintenz 1984 4 p refs Presented at the IEEE Symp. on Security and Privacy, Oakland, Calif., 30 Apr. 1984

(Contract DE-AC04-76DP-00789)
(DE84-010148; SAND-83-2564C; CONF-8404109-2) Avail: NTIS HC A04/MF A01

A linear stability theory for magnetically insulated systems was formulated by linearizing the general 3-D, time dependent theory of Mendel, Seidel, and Slut. It is found that, case of electron trajectories which are nearly laminar, with only small transverse motion, several suggestive simplifications occur in the eigenvalue equations. DOE

N84-29139# Sandia Labs., Albuquerque, N. Mex. Microwave, Bipolar IC, and Discrete Device Product Engineering Div.
TRANSIENT RESPONSE OF GaAs MICROWAVE POWER FET TO X-RAY PULSES
Marcelino G. Armendariz and J. G. Castle, Jr. Mar. 1984 22 p refs
(Contract DE-AC04-76DP-00789)
(DE84-008816; SAND-83-0479) Avail: NTIS HC A02/MF A01

The GaAs MESFETs, constructed with a 2 micron high mobility low conductivity VPE buffer layer, were exposed at room temperature to the X-ray pulse from a FEBETRON 705 source up to dose rates of 9 x 10(10) rad(Si)/s. Upset of the 2-GHz output signal and its recovery time depended on how well the nominal 50-ohm test circuit lines were matched to 50 ohms. Strong increases in Ids tracked the X-ray pulse, approached peak values of two times IDSS and usually showed a 10% tail which always disappeared in microseconds. Evidence for a backgating effect was not found. No primary photocurrents could be identified. DOE

N84-29140# Telefunken Electronic G.m.b.H., Heilbronn (West Germany).
IMPROVEMENTS OF PROPERTIES AND QUALITY OF LED DISPLAYS Final Report, Mar. 1983
Werner Schairer Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 60 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-043; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12,50

Photoluminescence spectra of LED displays were measured by the multichannel principle. A method to measure the dominant wavelength was developed and a color uniformity of + or - 1 nm is obtained. Linear arrays with 5 to 30 elements, two-dimensional arrays with 240 to 1600 elements and a round analog display with 90 LED were developed. Contrast enhancement by optical filters was investigated, and a visibility in 10 Klx ambients is achieved for neodymium and praseodymium doped filters.
Author (ESA)

N84-29141# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.
FLAT PANEL Final Report, Dec. 1982
Alois Schauer Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 100 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-048; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21

A flat monochrome monitor and a flat color panel are presented. The principle is phosphor excitation by electrons from a gas discharge source. The active area on the screen is 12 in and the thickness is 2 1/3 in. The monochrome display matches the performance of a 14 in cathode ray tube monitor. On it, 28 x 80 alphanumeric characters can be displayed and the individually addressable 448 x 720 pixels may be used for graphics as well. Successful on line computer operation of the monitor is shown. Flat panels with full color capability and 286 x 720 single pixels corresponding to 288 x 240 color triplets were built, giving a real time TV display with gray scale and good resolution. Author (ESA)

N84-29142# AEG-Telefunken, Ulm (West Germany). Fachbereich Technische Roehre.
DEVELOPMENT OF A 30 GHz/10 W TRAVELING WAVE TUBE Final Report, Dec. 1980
Peter Heumueller Bonn Bundesministerium fuer Forschung und Technologie Mar. 1984 50 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-004; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,50

A 30 GHz/10 W traveling wave tube for satellite communication is described. Frequency range = 29.3 to 30.3 GHz; output = 10 W; gain = 40 dB, efficiency = 25 %, and weight = 1 kg.
Author (ESA)

N84-29143# Valvo Roehren- und Halbleiterwerke der Philips G.m.b.H., Hamburg (West Germany).
VLSI SYSTEMS OF DIGITAL SIGNAL PROCESSING FOR CONSUMER APPLICATIONS Final Report, Sep. 1982
Walter Demmer and Dieter Gutsmann Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 78 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-060; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16,50

Digital signal processing for consumer application video tape recorders to improve noise reduction, dropout compensation and time-base correction is treated. Circuits with complex function units were developed to reduce basic cells, such as adders and registers. Very large scale integration component chip areas were minimized to increase the number of functions per chip. An improved picture quality of video tape recorders with NMOS-VLSI circuits in playback mode is achieved. These circuits can be run at a clock rate up to 20 Mc/sec. Author (ESA)

N84-29144# Stuttgart Univ. (West Germany). Inst. fuer Netzwerk und Systemtheorie.
PRECISION CLOCK GENERATORS IN Ta THIN FILM TECHNOLOGY Final Report, Jul. 1981
Ernst Lueder, Traugott Kallfass, Bernd Kaiser, Walter Ludescher, and Franz Sischka Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 93 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-073; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19,50

Highly stable RC oscillators in hybrid Ta thin film technology are discussed. The oscillator consists of a passive frequency determining network with temperature compensated thin film resistors, capacitors, and an amplitude controlled amplifier. The single layer tantalum technology for R's and C's provides maximum values for temperature stability and long term stability. Using discrete components in a printed circuit board instead of an IC, leads to a relatively high power consumption. An oscillator with partly selected and trimmed components can attain the temperature stability of a 32 kHz quartz oscillator in the temperature range of 22 to 45 C. Author (ESA)

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N84-29145# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technology.

FLOW OF A SIMPLE VISCOELASTIC FLUID IN A THIN LUBRICATING OIL [LEPKOSPREZYSTEJ CIECZY PROSTEJ W CIENKIEJ WARSTWIE SMARUJACEJ]
Mieczyslaw Gosiewski 1983 29 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

The flow of a thin viscoelastic fluid in an interstice between a plane and an infinite flat surface not parallel to the plane is calculated. The rheologic properties of the fluid are represented with an equation demonstrating its basic viscosimetric functions. The equation is solved using a recurrence perturbation method that is dependent on a parameter that combines material functions and geometric parameters. The findings demonstrate that in cases of thin interstices, an analytic solution both for the resolution of the flow of a liquid and for the resolution of stress effects is possible to obtain. The essential features of the described work are the use of a general rheologic model and the possibility of interpreting the results obtained for liquid disintegrating speed.
Author

N84-29146 British Library Lending Div., Boston Spa (England).
DETERMINING THE COEFFICIENT OF HEAT TRANSFER DURING THE FILTRATION OF A HEAT-CARRYING AGENT THROUGH A COIL
V. G. Lisienko, V. A. Shirinkin, and G. M. Ryzhkov 26 Apr. 1984 7 p refs Transl. into ENGLISH from Izv. (USSR) p 101-104
(BLL-M-35601-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

The equipment used for determining the coefficients of heat transfer when coils are heated by flowing hot gas through them is described. Coils of different diameter wires were heated. The filtration rates varied. Coefficients of heat transfer are obtained for differential filtration rates.
Author

N84-29147*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
SRB/FWC WATER IMPACT: FLEXIBLE BODY LOADS TEST Monthly Progress Report, May 1984
Jun. 1984 18 p refs
(Contract NAS8-35326)
(NASA-CR-171076; NAS 1.26:171076; MPR-12) Avail: NTIS HC A02/MF A01 CSCL 20D

Two technical areas were examined: evaluation of potential correction methods for spurious case strain outputs from the pressure transducers during the NSWC tests; and assessing procedures for modifying either the excitation function or the response function to account for hydroelastic effects.
Author

N84-29148*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
APPLICATION OF THE IMPLICIT MACCORMACK SCHEME TO THE PARABOLIZED NAVIER-STOKES EQUATIONS Interim Report
J. L. Lawrence, J. C. Tannehill, and D. S. Chaussee May 1984 69 p refs Prepared in cooperation with Iowa State Univ. of Science and Technology, Ames
(Contract NCA2-OR340-301)
(NASA-CR-166579; NAS 1.26:166579; ISU-ERI-Ames-84432) Avail: NTIS HC A04/MF A01 CSCL 20D

MacCormack's implicit finite-difference scheme was used to solve the two-dimensional parabolized Navier-Stokes (PNS) equations. This method for solving the PNS equations does not require the inversion of block tridiagonal systems of algebraic equations and permits the original explicit MacCormack scheme to be employed in those regions where implicit treatment is not needed. The advantages and disadvantages of the present adaptation are discussed in relation to those of the conventional Beam-Warming scheme for a flat plate boundary layer test case. Comparisons are made for accuracy, stability, computer time, computer storage, and ease of implementation. The present method was also applied to a second test case of hypersonic laminar flow over a 15% compression corner. The computed results compare favorably with experiment and a numerical solution of the complete Navier-Stokes equations.
R.J.F.

N84-29149# Los Alamos Scientific Lab., N. Mex.
PRINCIPLES AND PROSPECTS FOR MICRO HEAT PIPES
T. P. Cotter 1984 9 p refs Presented at the 5th Intern. Heat Pipe Conf., Tsukuba, Ibaraki, Japan, 14-18 May 1984
(Contract W-7405-eng-36)
(DE84-006035; LA-UR-84-120; CONF-840578-1) Avail: NTIS HC A02/MF A01

The fabrication and purpose of microminiature wickless heat pipes were discussed. Control of the volume of working fluid in the heat pipes and the problem of equilibrium flow were two of the parameters addressed. A theoretical analysis of the pipe performance characteristics shows that they have nearly the heat transport capability expected by scaling down from conventional heat pipes. They appear attractive for applications requiring close temperature control, but having only modest cooling requirements.
R.S.F.

N84-29150*# Lockheed Missiles and Space Co., Palo Alto, Calif.
USER'S GUIDE TO THE NOZL3D AND NOZLIC COMPUTER PROGRAMS
P. D. Thomas Dec. 1980 363 p
(Contract NAS1-15084)
(NASA-CR-159173; NAS 1.26:159173; LMSC-D636857) Avail: NTIS HC A16/MF A01 CSCL 20D

Complete FORTRAN listings and running instructions are given for a set of computer programs that perform an implicit numerical solution to the unsteady Navier-Stokes equations to predict the flow characteristics and performance of nonaxisymmetric nozzles. The set includes the NOZL3D program, which performs the flow computations; the NOZLIC program, which sets up the flow field initial conditions for general nozzle configurations, and also generates the computational grid for simple two dimensional and axisymmetric configurations; and the RGRIDD program, which generates the computational grid for complicated three dimensional configurations. The programs are designed specifically for the NASA-Langley CYBER 175 computer, and employ auxiliary disk files for primary data storage. Input instructions and computed results are given for four test cases that include two dimensional, three dimensional, and axisymmetric configurations.
Author

N84-29151*# Ohio State Univ., Columbus.
A NUMERICAL SIMULATION OF THE DISPERSAL OF AERIAL SPRAYS
M. B. Bragg Hampton, Va. NASA. Langley Research Center Nov. 1981 110 p refs
(NASA Order L-7965-B)
(NASA-CR-165816; NAS 1.26:165816; AARL-TR-81-0) Avail: NTIS HC A06/MF A01 CSCL 20D

A computer program was developed to predict the trajectory, ground deposition, and drift of liquid sprays injected into the wake of an agricultural aircraft in ground effect. The program uses a horseshoe vortex wake model and includes the effects of liquid droplet evaporation, crosswind, the propeller slipstream, ground effect, and tunnel walls on small scale models. This user's guide includes several case examples demonstrating user options. A complete listing of the FORTRAN program is provided.
Author

N84-29152*# Scientific Research Associates, Inc., Glastonbury, Conn.
THREE-DIMENSIONAL UNSTEADY VISCOUS FLOW ANALYSIS OVER AIRFOIL SECTIONS Final Report
B. C. Weinberg and S. J. Shamroth Jun. 1984 68 p refs
(Contract NAS1-17573)
(NASA-CR-172368; NAS 1.26:172368; R84-900027F) Avail: NTIS HC A04/MF A01 CSCL 20D

A three-dimensional solution procedure for the approximate form of the Navier-Stokes equation was exercised in the two- and three-dimensional modes to compute the unsteady turbulent boundary layer on a flat plate corresponding to the data of Karlsson. The procedure is based on the use of a consistently split Linearized Block Implicit technique in conjunction with a QR operator scheme. New time-dependent upstream boundary conditions were developed that yielded realistic solutions for the interior in the

vicinity of the upstream boundary. Comparisons of the computation employing these boundary conditions with the data indicate that both qualitative and quantitative agreement was obtained for the mean velocity and the in phase and out of phase components of the first harmonic of the velocity. In addition, the calculation gave results for the skin friction phase angle that had expected physical behavior for large distances downstream of the inflow boundary. For the three-dimensional case, the two-dimensional data of Karlsson was considered, but in a coordinate system skewed at 45 deg to the free stream direction. The results of the calculations were in excellent agreement with the data and the two-dimensional computations. Author

N84-29153*# Softcom Systems, Inc., Huntsville, Ala.
SPAR IMPROVED STRUCTURE-FLUID DYNAMIC ANALYSIS CAPABILITY, PHASE 2 Final Report
M. L. Pearson 29 Jun. 1984 75 p refs Prepared in cooperation with Lockheed Missiles and Space Co., Huntsville, Ala.
(Contract NAS8-34975)
(NASA-CR-171078; NAS 1.26:171078; LMSC-HREC-TR-D951490) Avail: NTIS HC A04/MF A01 CSCL 20D

An efficient and general method of analyzing a coupled dynamic system of fluid flow and elastic structures is investigated. The improvement of Structural Performance Analysis and Redesign (SPAR) code is summarized. All error codes are documented and the SPAR processor/subroutine cross reference is included. M.A.C.

N84-29154*# National Aeronautics and Space Administration, Washington, D. C.
FLOW PROPERTIES OF CONCENTRATED SUSPENSIONS
Kenichi Hattori and Kaichi Izumi Apr. 1984 21 p refs Transl. into ENGLISH from "Kohnohdo Sasupenjon no Ryudoh Toluse" Japan, Seramikkusu, v. 18, no. 2, 1983 p 103-111 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77431; NAS 1.15:77431) Avail: NTIS HC A02/MF A01 CSCL 20D

The viscosity and flow behavior of a concentrated suspension, with special emphasis on fresh concrete containing a superplasticizer, is analyzed according to Newton's law of viscosity. The authors interpreted Newton's law in a new way, and explain non-Newton flow from Newton's law. The outline of this new theory is given. Viscosity of suspensions, and the effect of dispersants are analyzed. R.J.F.

N84-29155*# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
THE STRUCTURE OF EVAPORATING AND COMBUSTING SPRAYS: MEASUREMENTS AND PREDICTIONS Semiannual Status Report, 1 Jan. - 30 Jun. 1984
J.-S. Shuen, A. S. P. Solomon, and G. M. Faeth Jul. 1984 33 p refs
(Grant NAG3-190)
(NASA-CR-173778; NAS 1.26:173778) Avail: NTIS HC A03/MF A01 CSCL 20D

An apparatus developed, to allow observations of monodisperse sprays, consists of a methane-fueled turbulent jet diffusion flame with monodisperse methanol drops injected at the burner exit. Mean and fluctuating-phase velocities, drop sizes, drop-mass fluxes and mean-gas temperatures were measured. Initial drop diameters of 100 and 180 microns are being considered in order to vary drop penetration in the flow and effects of turbulent dispersion. Baseline tests of the burner flame with no drops present were also conducted. Calibration tests, needed to establish methods for predicting drop transport, involve drops supported in the post-flame region of a flat-flame burner operated at various mixture ratios. Spray models which are being evaluated include: (1) locally homogeneous flow (LFH) analysis, (2) deterministic separated flow (DSF) analysis and (3) stochastic separated flow (SSF) analysis. A.R.H.

N84-29156*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
SRB/FWC WATER IMPACT: FLEXIBLE BODY LOADS TEST Monthly Progress Report, Jun. 1984
Jul. 1984 11 p refs
(Contract NAS8-35326)
(NASA-CR-173786; NAS 1.26:173786; MPR-13) Avail: NTIS HC A02/MF A01 CSCL 20D

The modeling of the cavity collapse pressure loading is discussed. There are excellent high speed color films of the quarter scale model during cavity collapse. In these films, it is possible to see a very clearly defined pressure wave front propagating circumferentially around the vehicle that seems to be associated at least on the lee side with an abrupt rise in pressure at each pressure transducer. By using a motion analyzer and stepping through the films, the location of this wave front is tracted at a number of time intervals for drops 17 through 21. The entry conditions and average wave front velocity are shown. Mathematical formulae aid in the reconstruction of the spatial distribution of the pressure. M.A.C.

N84-29157*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TURBULENCE AND SURFACE HEAT TRANSFER NEAR THE STAGNATION POINT OF A CIRCULAR CYLINDER IN TURBULENT FLOW
Chi R. Wang [1983] 17 p refs Prepared for presentation at the Winter Ann. Meeting of the ASME, New Orleans, 9-14 Dec. 1984
(NASA-TM-83732; E-2210; NAS 1.15:83732) Avail: NTIS HC A02/MF A01 CSCL 20D

A turbulent boundary layer flow analysis of the momentum and thermal flow fields near the forward stagnation point due to a circular cylinder in turbulent cross flow is presented. Turbulence modeling length scale, anisotropic turbulence initial profiles and boundary conditions were identified as functions of the cross flow turbulence intensity and the boundary layer flow far field velocity. These parameters were used in a numerical computational procedure to calculate the mean velocity, mean temperature, and turbulence double correlation profiles within the flow field. The effects of the cross flow turbulence on the stagnation region momentum and thermal flow fields were investigated. This analysis predicted the existing measurements of the stagnation region mean velocity and surface heat transfer rate with cross flow Reynolds number and turbulence intensity less than 250,000 and 0.05, respectively. Author

N84-29158*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE GOERTLER VORTEX INSTABILITY MECHANISM IN THREE-DIMENSIONAL BOUNDARY LAYERS Final Report
Philip Hall (Imperial Coll. of Science and Technology) Jun. 1984 40 p refs
(Contract NAS1-17070)
(NASA-CR-172370; ICASE-84-17; NAS 1.26:172370) Avail: NTIS HC A03/MF A01 CSCL 20D

The two dimensional boundary layer on a concave wall is centrifugally unstable with respect to vortices aligned with the basic flow for sufficiently high values of the Goertler number. However, in most situations of practical interest the basic flow is three dimensional and previous theoretical investigations do not apply. The linear stability of the flow over an infinitely long swept wall of variable curvature is considered. If there is no pressure gradient in the boundary layer the instability problem can always be related to an equivalent two dimensional calculation. However, in general, this is not the case and even for small values of the crossflow velocity field dramatic differences between the two and three dimensional problems emerge. When the size of the crossflow is further increased, the vortices in the neutral location have their axes locally perpendicular to the vortex lines of the basic flow. B.G.

N84-29159*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

A SPECTRAL COLLOCATION METHOD FOR THE NAVIER-STOKES EQUATIONS Final Report
M. R. Malik (High Technology Corp., Hampton, Va.), T. A. Zang, and M. Y. Hussaini Jun. 1984 51 p refs
(Contracts NAS1-15810; NAS1-16394; NAS1-16916; NAS1-17070; NAS1-17130)
(NASA-CR-172365; ICASE-84-19; NAS 1.26:172365) Avail: NTIS HC A04/MF A01 CSCL 20D

A Fourier-Chebyshev spectral method for the incompressible Navier-Stokes equations is described. It is applicable to a variety of problems including some with fluid properties which vary strongly both in the normal direction and in time. In this fully spectral algorithm, a preconditioned iterative technique is used for solving the implicit equations arising from semi-implicit treatment of pressure, mean advection and vertical diffusion terms. The algorithm is tested by applying it to hydrodynamic stability problems in channel flow and in external boundary layers with both constant and variable viscosity. Author

N84-29160*# National Aeronautics and Space Administration, Washington, D. C.
NUMERICAL SOLUTION FOR THE INTERACTION OF SHOCK WAVE WITH LAMINAR BOUNDARY LAYER IN TWO-DIMENSIONAL FLOW ON A FLAT PLATE Ph.D. Thesis
Uriel Landau Apr. 1984 196 p refs Transl. into ENGLISH of "Pitron numeri shel hainterakziyah beyn shikhvat gvool laminarit lebeyn gal-hailem besreemah doo-meymadit al looakh shatooakh" Haifa, Israel, Jun. 1976 191 p Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prepared by Technion - Israel Inst. of Tech.
(Contract NASw-3541)
(NASA-TM-77408; NAS 1.15:77408) Avail: NTIS HC A09/MF A01 CSCL 20D

The finite difference computation method was investigated for solving problems of interaction between a shock wave and a laminar boundary layer, through solution of the complete Navier-Stokes equations. This method provided excellent solutions, was simple to perform and needed a relatively short solution time. A large number of runs for various flow conditions could be carried out from which the interaction characteristics and principal factors that influence interaction could be studied. Author

N84-29161*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Aerospace and Ocean Engineering Dept.
REAL JET EFFECTS ON DUAL JETS IN A CROSSFLOW Semiannual Report
Joseph A. Schetz Aug. 1984 18 p refs
(Grant NAG2-256)
(NASA-CR-173817; NAS 1.26:173817) Avail: NTIS HC A02/MF A01 CSCL 20D

A 6-ft by 6-ft wind tunnel section was modification to accommodate the 7-ft wide NASA dual-jet flate model in an effort to determine the effects of nonuniform and/or noncircular jet exhaust profiles on the pressure field induced on a nearby surface. Tests completed yield surface pressure measurements for a 90 deg circular injector producing exit profiles representative of turbofan nozzles (such as the TF-34 nozzle). The measurements were obtained for both tandem and side-by-side jet configurations, jet spacing of S/D =2, and velocity ratios of R=2.2 and 4.0. Control tests at the same mass flow rate but with uniform exit velocity profiles were also conducted, for comparison purposes. Plots for 90 deg injection and R=2.2 show that the effects of exit velocity profile nonuniformity are quite significant. A.R.H.

N84-29162# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
SECONDARY FLOWS AND ENDWALL BOUNDARY LAYERS IN AXIAL TURBOMACHINES
1984 484 p refs Lecture Series held at Rhode Saint Genese, Belgium, 7-11 May 1984
(VKI-LS-1984-05) Avail: NTIS HC A21/MF A01

Secondary flow theory in straight and annular cascades; secondary loss prediction methods; experimental research on secondary flows in annular turbine cascades; three dimensional rotational inviscid flow calculation; annulus endwall boundary layer theory; calculation of three dimensional viscous flows in annular cascades using parabolized Navier-Stokes equations; and low aspect ratio turbine design are covered. For individual titles, see N84-29163 through N84-29169.

N84-29163# Durham Univ. (England).
SECONDARY FLOW THEORY IN STRAIGHT AND ANNULAR CASCADES
D. G. Gregory-Smith *In* Von Karman Inst. for Fluid Dyn. Secondary Flows and Endwall Boundary Layers in Axial Turbomachines 1984 57 p refs (For primary document see N84-29162 19-34)
Avail: NTIS HC A21/MF A01

Applications of secondary flow approximation to calculating three dimensional flow in turbomachinery are discussed. Secondary vorticity in a simple cascade is calculated using a method based on vortex tracing and Kelvin's circulation theorem. Generalized expressions based on the vorticity transport equation are developed. Vorticity in a rotating system is analyzed. Secondary velocities in cascades are calculated. Author (ESA)

N84-29164# Durham Univ. (England).
SECONDARY LOSS PREDICTION METHODS
D. G. Gregory-Smith *In* Von Karman Inst. for Fluid Dyn. Secondary Flows and Endwall Boundary Layers in Axial Turbomachines 1984 14 p refs (For primary document see N84-29162 19-34)
Avail: NTIS HC A21/MF A01

Secondary flow effects on turbine performance are recalled, and prediction of losses by correlation and secondary flow theory methods is discussed. Neither approach is satisfactory, since, in the machine, blade row interference, radial flows, tip clearance, and walls with steps, grooves, gaps and flare modify secondary flow. Author (ESA)

N84-29165# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
EXPERIMENTAL RESEARCH ON SECONDARY FLOWS IN ANNULAR TURBINE CASCADES AT THE VON KARMAN INSTITUTE
E. Boletis *In its* Secondary Flows and Endwall Boundary Layers in Axial Turbomachines 1984 79 p refs (For primary document see N84-29162 19-34)
Avail: NTIS HC A21/MF A01

Investigations of secondary flows in isolated annular cascades with collateral inlet boundary layers; in an annular turbine nozzle guide vane followed by a rotating blade row; in isolated annular cascades with skewed inlet boundary layers; and in a turbine stator preceded by a full stage are summarized. Secondary flow patterns in annular configurations, e.g., the mutual interference of the passage vortices and the radial pressure gradient, the radial migration of low momentum material, effects of tip contouring inlet skew are studied. Differences between the flow field in annular and straight cascades can be derived from comparison with other test results. Author (ESA)

N84-29166# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
THREE-DIMENSIONAL ROTATIONAL INVISCID FLOW CALCULATION
T. Arts *In its* Secondary Flows and Endwall Boundary Layers in Axial Turbomachines 1984 69 p refs (For primary document see N84-29162 19-34)
Avail: NTIS HC A21/MF A01

Three dimensional rotational and/or transonic flow in turbomachinery is calculated by a fully explicit, time marching, corrected viscosity, finite volume method using a cylindrical coordinate system. Inside the passage, agreement between computed and measured values is fairly good, whereas the influence of the uniform outlet condition is greater downstream of the blade passage. Results confirm that the main secondary flows (horseshoe vortex and passage vortex) are an inviscid phenomenon caused by

vorticity in the incoming flow, although the origin of this vorticity is the viscous endwall boundary layer. Author (ESA)

N84-29167# Ecole Centrale de Lyon (France).
ANNULUS ENDWALL BOUNDARY LAYER THEORY
F. Leboeuf *In* Von Karman Inst. for Fluid Dyn. Secondary Flows and Endwall Boundary Layers in Axial Turbomachines 1984 122 p refs (For primary document see N84-29162 19-34)
Avail: NTIS HC A21/MF A01

A method to compute the annulus endwall boundary layers in a multistage turbomachine, which uses the notions of inviscid and secondary flows is outlined. The inviscid flow is assumed to induce the main part of the static pressure field, while the secondary flows are characterized by intense sources of vorticities. The inviscid flow direction is used to define a turbulent closure for the longitudinal velocity component via two-dimensional boundary layer concepts; the other transversal velocity components are deduced from the longitudinal vorticity component. Strong coupling between the inviscid and secondary flow computations gives very good numerical behavior. A local simulation of the inviscid flow response to the secondary flows influences is described, and the two flows are treated simultaneously. Experiments and computations are compared for a transonic axial flow compressor. Author (ESA)

N84-29168# Technische Hochschule, Aachen (West Germany).
CALCULATION OF THREE DIMENSIONAL VISCOUS FLOWS IN ANNULAR CASCADES USING PARABOLIZED NAVIER-STOKES EQUATIONS
M. Lawerenz *In* Von Karman Inst. for Fluid Dyn. Secondary Flows and Endwall Boundary Layers in Axial Turbomachines 1984 43 p refs (For primary document see N84-29162 19-34)
Avail: NTIS HC A21/MF A01

Numerical algorithms for describing the endwall boundary layers and secondary flows in high turning turbine cascades are described. Partially-parabolic methods which cover three-dimensional viscous flow effects are outlined. Introduction of tip-clearance models and modifications of no-slip conditions without the use of wall functions expand the range of application and improve accuracy. Simultaneous computation of the profile boundary layers by refinement of the mesh size in the circumferential direction makes it possible to describe the boundary layer interaction in the corners formed by the bladings and the endwalls. The partially-parabolic method means that the streamwise elliptic coupling is well represented by the given pressure field and that separation does not occur, but it is not possible to describe the separation of the endwall boundary layer near the leading edge and the horse-shoe vortex there properly. Author (ESA)

N84-29169# Rolls-Royce Ltd., Derby (England).
LOW ASPECT RATIO TURBINE DESIGN AT ROLLS-ROYCE c37
S. Morgan *In* Von Karman Inst. for Fluid Dyn. Secondary Flows and Endwall Boundary Layers in Axial Turbomachines 1984 89 p refs (For primary document see N84-29162 19-34)
Avail: NTIS HC A21/MF A01

Low aspect ratio turbine flowpath, vortex philosophy, surface velocity distributions, stacking, and manufacturing and cooling considerations are discussed. The Turbine Aerodynamic Cooling Interactive User Suite computer code for turbine design is described. Three dimensional analysis in a low aspect ratio high pressure stator design is outlined. Author (ESA)

N84-29170# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN ANALYTICAL STUDY OF A LOCALLY COOLED HIGH REYNOLDS NUMBER SIMULATION TECHNIQUE M.S. Thesis
M. S. Borkowski Mar. 1984 97 p
(AD-A141062; AFIT/GA/AA/84M-1) Avail: NTIS HC A05/MF A01 CSCL 20/4

An analytical study of a technique for achieving high Reynolds number similarity in a wind tunnel was conducted. The technique under consideration required that the momentum boundary layer be immersed in a layer of cryogenically cooled gas so that boundary layer development would be determined by the low temperature fluid properties. The experimental technique was shown to be theoretically feasible, with effective Reynolds number increased by as much as a factor of seven or eight, provided that sufficiently high mass rates of flow of cool gas could be provided. Author (GRA)

N84-29171# Maryland Univ., College Park.
CONFORMING FINITE ELEMENT METHODS FOR INCOMPRESSIBLE AND NEARLY INCOMPRESSIBLE CONTINUA
L. R. Scott and M. Vogelius (Maryland Univ., College Park) Mar. 1984 44 p
(Contract N00014-77-C-0623)
(AD-A141117; BN-1018) Avail: NTIS HC A03/MF A01 CSCL 12/1

Interest here is in finite element discretizations of problems involving an incompressibility condition. As model problems we consider the Stokes equations for the flow of a viscous, incompressible fluid and the equations of linear plane-strain elasticity for the deformation of an isotropic, nearly incompressible solid. In both cases the incompressibility condition takes the form of a divergence constraint. Although this is the most simple formulation, the proper understanding of how an approximate method satisfies the constraint represents an important step towards the understanding of more complicated situations, involving e.g., the Navier-Stokes equations or the equations of nonlinear elasticity. The finite element methods we study have the property that the approximations to the velocities, respectively to the displacements, are continuous; such methods are generally referred to as conforming. GRA

N84-29172# Wisconsin Univ., Madison. Mathematics Research Center.
HYPERBOLICITY AND CHANGE OF TYPE IN THE FLOW OF VISCOELASTIC FLUIDS Technical Summary Report
D. D. Joseph, M. Renardy, and J. C. Saut Mar. 1984 57 p
(Contract DAAG29-80-C-0041; Grants NSF MCS-79-27062; NSF MCS-82-10950; NSF MCS-82-15064)
(AD-A141508; MSR-TSR-2657) Avail: NTIS HC A04/MF A01 CSCL 20/4

The equations governing the flow of viscoelastic liquids are classified according to the symbol of their differential operators. Propagation of singularities is discussed and conditions for a change of type are investigated. The vorticity equation for steady flow can change type when a critical condition involving speed and stresses is satisfied. This leads to a partitioning of the field of flow into subcritical and supercritical regions, as in the problem of transonic flow. Author (GRA)

N84-29173# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.
AN EXPLANATION OF SPIN-UP INSTABILITIES FOR A 155MM BINARY PROJECTILE Final Report
W. P. DAmico, Jr. Apr. 1984 30 p
(DA Proj. 1L1-62618-AH-80)
(AD-A141534; AD-F300426; ARBRL-MR-03355) Avail: NTIS HC A03/MF A01 CSCL 19/1

In 1971 during the development testing of the 155mm XM687 binary projectile, liquid-induced flight instabilities were observed. Tests were conducted that indicated unstable behavior for fill ratios of 80 to 100%. However, stable flights occurred for a fill ratio of 65%. A solid, cylindrical spacer was fitted to the interior of the aft end of the rear payload canister, thus shortening the overall interior length of the payload compartment. This simple modification yielded stable flights and was incorporated into the standard projectile. This report presents yawsonde data and analytical models that explain the stabilizing effect of the spacer which was eventually employed in the M687 projectile. GRA

N84-29174# Wisconsin Univ., Madison. Mathematics Research Center.
REMARKS ON THE FLOW BETWEEN TWO PARALLEL ROTATING PLATES Technical Summary Report

S. V. Parter and K. R. Rajagopal Feb. 1984 19 p
(Contract DAAG29-80-C-0041)
(AD-A141582; MRC-TSR-2649) Avail: NTIS HC A02/MF A01 CSCL 20/4

The flow of the classical linearly viscous fluid between two infinite parallel planes rotating with constant (but different) angular velocities about a common axis has received a great deal of attention during the past 60 years. However, until recently the emphasis has been on solutions which are axi-symmetric. Recently, Berker in his study of the flow between parallel planes, rotating with the same constant angular velocities about a common axis exhibited a one parameter family of solutions only one of which is axi-symmetric. In this study, the authors exhibit the existence of a one parameter family of solutions (for large viscosities) when the planes are rotating with constant but different angular velocities about a common axis or about non-coincident axes. GRA

N84-29175# Wisconsin Univ., Madison. Mathematics Research Center.
NOTE ON THE DISPLACEMENT EFFECT IN A SPINNING FLUID Technical Summary Report
R. E. Meyer Mar. 1984 21 p
(Contract DAAG29-80-C-0041)
(AD-A141599; MRC-TSR-2663) Avail: NTIS HC A02/MF A01 CSCL 20/4

The interpretation of viscous effects in perturbations of rapid, solid-body rotation of a fluid in a cylindrical gyroscope is discussed. This is bound up with the explanation of the roots of those effects and aims to improve the foundation on which more sophisticated questions in this field can be addressed successfully. To help with the clarification of viscous displacement effects, their explanation in Section 3 is prefaced by a discussion of two examples displaying some of the salient features in a simpler setting. Author (GRA)

N84-29176# Wisconsin Univ., Madison. Mathematics Research Center.
WAVE-LESS FREE-SURFACE PRESSURE DISTRIBUTIONS Technical Summary Report
J. M. Vanden-Broeck and E. O. Tuck Apr. 1984 44 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-01960)
(AD-A141630; MRC-TSR-2679) Avail: NTIS HC A03/MF A01 CSCL 20/4

Linear and nonlinear studies are made of two-dimensional free-surface flows under gravity, in which a disturbance is caused to an otherwise-uniform stream by a distribution of pressure over the free surface. In general, such a disturbance creates a system of trailing waves. However, there are special disturbances that do not, and some categories of such disturbances are discussed here. This work has potential applications to design of splash-less ship bows. Author (GRA)

N84-29177# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
INJECTION OF DRAG REDUCING ADDITIVES INTO TURBULENT WATER FLOWS: RESULTS FROM FACTORIAL DESIGN Annual Report, 1 Mar. 1983 - 29 Feb. 1984
D. T. Walker and W. G. Tiederman Apr. 1984 51 p
(Contract N00014-83-K-0183)
(AD-A141675; PME-FM-84-1) Avail: NTIS HC A04/MF A01 CSCL 20/4

The basic objective of this experimental study is to optimize the process of injecting drag-reducing additives into a water flow. The initial phase consisted of a factorial design where the concentration and flowrate of the injected additive as well as the angle and width of the injection slot were varied independently. The experiments were conducted in a rectangular cross section channel that has an aspect ratio of ten to one. Slots were located in both of the larger walls at a streamwise location where the channel flow of water was fully developed. Drag reduction was deduced from wall pressure measurements and wall-layer concentration of the additive was deduced from colorimeter measurements. Additive concentration varied from 100 to 400 ppm. Injection flowrates ranged from 200 to 400 ml/min. The slot angle was either 15 or 25 degrees while the slot width was either 1.27 mm or 2.54 mm. The quantity which was optimized (the merit function) was the integral of the drag reduction with respect to streamwise distance beginning at the initial location of positive drag reduction and ending at the location where the additive was uniformly mixed with the water. The results showed that additive concentrations less than 1 ppm yield drag reduction on the order of 20%. These results were achieved well downstream of the injector where it is hypothesized that the additive molecules were in an excellent conformation for reducing drag. GRA

N84-29178# Wisconsin Univ., Madison. Mathematics Research Center.
DYNAMIC CHANGES OF PHASE IN A VAN DER WAALS FLUID Technical Summary Report
R. Hagan and J. Serrin Mar. 1984 32 p
(Contract DAAG29-80-C-0041)
(AD-A141708; MRC-TSR-2666) Avail: NTIS HC A03/MF A01 CSCL 20/4

This paper gives sufficient conditions to guarantee the existence of a shock layer solution connecting two different equilibrium states in a van der Waals fluid. In particular, the equilibrium states can belong to two different phases of the fluid. The constitutive laws come from a modified Korteweg theory which is compatible with the Clausius Duhem inequality. The Clausius Duhem inequality in turn gives rise to a Liapunov function. The main mathematical tool is the LaSalle invariance principle. Author (GRA)

N84-29179# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
OSCILLATIONS OF A RESERVOIR WITH A FLUID ON THE FREE SURFACE OF WHICH A MEMBRANE IS LOCATED
L. V. Dokuchayev 31 May 1984 13 p Transl. into ENGLISH from Stroitelnaya Mekhanika i Raschet Sooruzheniy (USSR), no. 1(79), 1972 p 49-54
(AD-A142127; FTD-ID(RS)T-0073-84) Avail: NTIS HC A02/MF A01 CSCL 12/1

Large capacity reservoirs require analysis of the possible resonance excitation of wave motions of the liquid by wind or seismic pulsed loads. Oscillations of a rigid reservoir positioned on an elastic base and containing a perfect, incompressible liquid were considered. The free surface of the liquid was limited with a special membrane. Differential equations were employed to investigate the dynamic characteristics of this system. R.S.F.

N84-29180# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTA MECHANICA SINICA (SELECTED ARTICLES)
J. Lian and W. Lu 1 May 1984 24 p Transl. into ENGLISH from Lixue Xuebao (China), no. 4, 1983 p 414-425
(AD-A142128; FTD-ID(RS)T-1927-83) Avail: NTIS HC A02/MF A01 CSCL 20/4

The coherent structure of a turbulent boundary layer at zero pressure gradient and for the gradient of adverse pressure was investigated. The hydrogen bubble method was employed to examine the turbulent flow in a two dimensional diffusion sector in a water channel. In a separate work, tensor calculus was used to derive three dimensional weak conservation form equations, time dependent flow surface iterative equations, and characteristic theory of non-orthogonal spherical coordinates. These equations and theory are useful in solving the three dimensional turbomachine transonic flow field. R.S.F.

N84-29181# Illinois Inst. of Tech., Chicago.
CONCEPTUAL EXPERIMENTS IN TRANSITION TO TURBULENCE THROUGH COMBINED VISUALIZATION AND HOT-WIRE TECHNIQUES Final Report, Nov. 1980 - Jan. 1984
M. V. Morkovin and T. C. Corke 31 Apr. 1984 46 p
(Contract DAAG29-81-K-0012)
(AD-A142193; ARO-17690.1-EG) Avail: NTIS HC A03/MF A01 CSCL 20/4

This document contains Chapters on: Effects of Distributed

Roughness on Transition to Turbulence; and Generation of Instability Waves by External Unsteady Pressure Gradients. GRA

N84-29182# Pennsylvania State Univ., University Park. Applied Research Lab.

AN INVERSE LAMINAR BOUNDARY LAYER PROBLEM WITH ASSIGNED WALL SHEAR: THE MECHUL FUNCTION REVISITED

K. C. Kaufman and G. H. Hoffman 4 May 1984 45 p
(Contract N00024-79-C-6043)
(AD-A142328; ARL/PSU/TM-84-79) Avail: NTIS HC A03/MF A01 CSCL 20/4

An inverse method is presented for accurately determining the pressure gradient distribution for specified wall shear in a two-dimensional laminar boundary layer. In the inverse formulation, the pressure gradient is treated as a dependent variable that is only a function of the streamwise coordinate. The method presented here is a reformulation of the mechul function scheme of Cebeci and Keller with additional techniques to increase the stability of the solution. These techniques include the use of fourth order splines to approximate normal derivatives and three point backward finite differences for the streamwise derivatives. Partial pivoting is also used in the solution of the block tridiagonal system resulting from the linearized equations of motion. The solution is obtained using the Newton iteration method. Numerical examples are presented for self-similar and non-similar solutions.
Author (GRA)

N84-29183# California Univ., Berkeley. Lawrence Berkeley Lab.

SOME RECENT PROGRESS IN STEEP FRONT CALCULATIONS FOR POROUS FLOW

P. Concus, E. Kostlan, and J. A. Sethian Jan. 1984 17 p refs Presented at the 6th Intern. Conf. on Computing Methods in Appl. Sci. and Eng., Paris, 12 Dec. 1983
(Contract DE-AC03-76SF-00098)
(DE84-008249; LBL-17221; CONF-831256-2) Avail: NTIS HC A02/MF A01

A modification to the random choice method is investigated for solving the equations for multidimensional immiscible displacement in a porous medium. The principal feature of the modification is to represent multidimensional flow correctly by incorporating local properties of the flow into the one-dimensional Riemann solvers of the split random choice method. Advancing fronts are kept accurate and sharp. A numerical experiment is performed using the method to study the stabilizing effect of a small amount of physical capillary pressure on a case for which the advancing front is unstable. DOE

N84-29184# Northwestern Univ., Evanston, Ill.

EXPERIMENTAL NATURAL CONVECTIVE STUDIES WITHIN A COMPOUND PARABOLIC CONCENTRATOR ENCLOSURE

R. A. Tatara and G. Thodos 1983 18 p refs
(Grant DE-FG02-80CS-84054)
(DE84-006967; DOE/CS-84054/T1) Avail: NTIS HC A02/MF A01

Convection within a compound parabolic concentrator enclosure was determined. A receiver was heated electrically while the aperture had a duct cooled by water. The limbs of the collector were fabricated from aluminum. Temperatures were directly obtained with copper constantan thermocouples located throughout the entire enclosure and provide the basis needed to calculate the different modes of heat transfer. The constant heat flux at the receiver translates to a nearly isothermal state. The rates of natural convection are expressed in a Nu-Ra correlation where $1.0x10(7) < Ra < 4.0x10(7)$. To suppress natural convection, a horizontal partition is introduced at different heights between the receiver and aperture. These results are given as heat fluxes and temperature differences between the receiver and the aperture. The aperture partition and a flat plate geometry are compared.
DOE

N84-29185# Freie Univ., Berlin (West Germany). Tieftemperaturlab.

OPTIMIZED He 2 COOLING SYSTEMS FOR SPACE APPLICATION. BEHAVIOR AND HANDLING OF SUPERFLUID HELIUM AT g = 0, PHASE 2 Final Report, Oct. 1982

Hans-Dietrich Denner, Gustav Klipping, Klaus Lueders, Klaus-Dieter Schotte, Ursula Schotte, Zsolt Szuecs, and Udo Ruppert Bonn Bundesministerium fuer Forschung und Technologie Mar. 1984 65 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-006; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13,50

Separation of gas and liquid phase during the continuous evaporation of the coolant in the He2 cooling systems was investigated. A system with an annular flow gap of variable length allowing variation of the cooling capacity was tested on zero g flights under accelerations between 2 g and 0 g. A choking effect appears in the case of narrow long flow gaps. Author (ESA)

N84-29186# Karlsruhe Univ. (West Germany). Forschungsbereich Numerische Stroemungsmechanik am Rechenzentrum.

DEVELOPMENT OF A SELF-ADAPTED ERROR-CONTROLLED DIFFERENCE METHOD TO SOLVE THE THREE-DIMENSIONAL LAMINAR INCOMPRESSIBLE BOUNDARY LAYER EQUATIONS BY NUMERICALLY GIVEN CONTOURS DETERMINED BY POINTS [DIE ENTWICKLUNG EINES SELBSTSTEUERNDEN FEHLERUE BERWACHTEN DIFFERENZENVERFAHRENS ZUR LOESUNG DER DREIDIMENSIONALEN LAMINAREN INKOMPRESSIBLEN GRENZSCHICHTGLEICHUNGEN BEI PUNKTWEISE NUMERISCH GEGEBENER KONTUR]

W. Schoenauer, G. Glotz, H.-G. Daeubler, K. Raith, and K. Haefele Nov. 1983 556 p refs In GERMAN; ENGLISH summary Sponsored by Stiftung Volkswagenwerk
(Rept-24/83) Avail: NTIS HC A24/MF A01

The solution of the 3-D incompressible laminar boundary layer equations in streamline potential line coordinates is presented. The information about the 3-D body configuration and the inviscid velocity potential is assumed to be given by points. The inviscid streamlines containing the information about the body by points are computed. A difference method solves the boundary layer equations with self adapted step size and order in the streamline direction and with given grid in the potential line direction with self adapted order. In the normal direction the grid and the order are optimized in the stagnation point and then remain fixed. The dividing streamlines, in which many streamlines coincide, cause a singularity of the boundary layer equations. The resulting computer program is given. Author (ESA)

N84-29187# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Hauptabteilung Neue Technologie-Energietechnik.

SELECTIVE COATING HEAT PIPE COLLECTOR ADAPTATION TO SOLAR ENERGY PLANTS Final Report, Mar. 1982

Tilo Flesch Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 165 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-054; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33

Selective coated heat pipe collectors for solar energy plants are examined. An anodic coating process was developed in laboratory and transferred to a manufacturing process. A 1750 sqm absorber area, 224 sqm plate surface collector, and 44 sqm solar pump were coated. Corrosion protection was tested at temperatures of 130 C. Results show an idle run temperature of 168 C per 1000 W/sqm radiation and 30 C outdoor temperature for the single pane collector and 171 C for the double pane collector. An economical production of the collector is possible by reducing its weight. Author (ESA)

N84-29188# Lanchester Polytechnic, Coventry (England).

SUPER UPWINDING ELEMENTS OF DOUBT AND DISCRETE DIFFERENCES OF OPINION ON THE NUMERICAL MUDDLING OF THE INCOMPREHENSIBLE DEFECTIVE CONFUSION EQUA-

TION
K. E. Barrett 1983 24 p refs
Avail: NTIS HC A02/MF A01

An extension of the Leonard third order consistent method for the convection diffusion equation, which is valid at infinite mesh Reynolds numbers and performs better than the Hughes scheme on standard test problems is proposed. In a Petrov-Galerkin scheme based on quadratic trial and cubic test functions, an interlaced sequence of three and five point difference expressions are found. When the optimum parameters are used, these formulas admit constant and exponential solution but give errors for linear expressions unless the Reclet number is zero. Author (ESA)

N84-29189# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
BOUNDARY LAYER SOLUTION FOR THE RAYLEIGH-BENARD CONVECTION PROBLEM
Geert Zimmermann Dec. 1983 48 p refs
MPIS-19/1983; ISSN-0436-1199) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,35

A solution of a Rayleigh-Benard convection problem as a boundary layer problem using the method of matched asymptotic expansions (MAE) is described. Temperature and flow boundary layers are considered. It is shown that in the case with free boundary conditions no flow boundary layers occur. With rigid boundaries buoyancy effects are felt in the horizontal boundary layers even in the lowest order creating a flow boundary layer there. Temperature profiles for the boundary layers are obtained as series expansions in terms of temperature modes. Mode amplitudes may be determined, given the temperature profile at a nonsingular cross section of the boundary layer. The MAE, however, prescribes the initial temperature profiles for the layers in the corner, where the boundary layers become singular (infinite layer thickness). This difficulty can not be resolved within the framework of MAE, but a rational approximation to the solution can be devised. Author (ESA)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N84-29190 National Physical Lab., Teddington (England). Div. of Materials Applications.
AN OPTICAL TECHNIQUE FOR ASSESSING THE LONG-TERM ACCURACY OF LATERAL EXTENSOMETERS
G. Dean, B. E. Read, and J. C. Duncan Apr. 1984 17 p ref
(NPL-DMA(A)78; ISSN-0143-7313) Copyright. Avail: Issuing Activity

An optical interference technique for measuring the change in thickness of a test-piece of a transparent thermoplastic caused by the application of a load is described. Measurements of lateral displacement using this method are compared with data obtained using an electromechanical extensometer in a long term, uniaxial creep test. The optical method is found to be significantly more accurate at the longer times and exhibits less scatter in data. The technique can be applied in assessing the long term accuracy of lateral extensometers and in the design of an optical extensometer which shows potential for enabling a very high level of accuracy to be achieved. Author (ESA)

N84-29191*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRECISION MANIPULATOR HEATING AND COOLING APPARATUS FOR USE IN UHV SYSTEMS WITH SAMPLE TRANSFER CAPABILITY Patent Application
Ronald A. Outlaw and Bill T. Baugh, inventors (to NASA) Filed 31 Oct. 1983 11 p
(NASA-Case-LAR-13040-1; US-Patent-Appl-SN-547176) Avail: NTIS HC A02/MF A01 CSCL 14B

An improvement of a precision manipulator for use in Ultra High Vacuum (UHV) systems with sample transfer capability in which a spring loaded thermocouple and a heater electrode are both in direct contact with the transferred sample is described. The thermocouple and heater electrode assembly are mounted concentrically with a sample receiving block on the end of an offset manipulator. When a sample is transferred from an introduction chamber into the UHV chamber, it contacts the spring loaded thermocouple and then seats a heater electrode. Cooling by a copper plate and a strap combined with the resistance heating capability allow sample temperatures over the range of 150-1750 K while positioned in front of any diagnostic instrument in the UHV system and while taking data with these instruments. NASA

N84-29192*# Cornell Univ., Ithaca, N.Y. Center for Radiophysics and Space Research.
LONG WAVELENGTH PHOTOCONDUCTIVE DETECTORS FOR AIRBORNE AND ORBITAL INFRARED ASTRONOMY Final Technical Report
J. R. Houck Aug. 1983 5 p refs
(Grant NAG2-177)
(NASA-CR-166586; NAS 1.26:166586) Avail: NTIS HC A02/MF A01 CSCL 14B

Seven gallium doped germanium (Ge:Ga) photoconductive infrared detectors were fabricated and mounted in integrating cavities. In addition, a cold preamplifier package consisting of J230 junction field effect transistors (JFETs) was produced. Tests of the system under low photon background conditions indicated that sensitivity was limited by the Johnson noise of the load resistor. The detectors were mounted in the Ames cooled grating spectrometer, and flown on the Kuiper Airborne Observatory. Good quality astronomical data were obtained during the flight of 7 July 1983. Author

N84-29193# Argonne National Lab., Ill. Materials Science and Technology Div.
CHOPPER SPECTROMETERS
D. L. Price 1984 22 p refs Presented at the Workshop on High Energy Excitations in Condensed Matter, Los Alamos, N. Mex., 13-15 Feb. 1984
(Contract W-31-109-eng-38)
(DE84-009205; CONF-840264-2) Avail: NTIS HC A02/MF A01

Chopper spectrometers which are devices for measuring the dynamics of a condensed system, are described in terms of the scattering function. The basic concepts of the chopper spectrometer and of time of flight analysis and the performance of the instrument are reviewed. The method is illustrated by examples. DOE

N84-29194*# Electro-Optics Consultants, Inc., Huntsville, Ala.
COLOR FILM PRESERVATION SYSTEM: BREADBOARD DEVELOPMENT Final Report
30 Apr. 1984 13 p refs
(Contract NAS8-35822)
(NASA-CR-171099; NAS 1.26:171099) Avail: NTIS HC A02/MF A01 CSCL 14E

The development of an economically feasible system to prevent and/or substantially reduce the degradation of the color dyes of the retinal reflex images recorded on color slide films is discussed. Three different types of film storage systems were designed, fabricated, and tested. An extruded plastic cylindrical container was pressurized and no observable leakage occurred, indicating that long term storage is possible. An operational breadboard was fabricated. The system offers the capability to determine purging requirements to achieve various levels of oxygen concentration and precise leakage of various container configurations. The system has digitial display of oxygen content of the container, automatic control of the oxygen content as well as of the

container to atmosphere pressure differential, and flow rate readout during purging. A.R.H.

N84-29195# Naval Research Lab., Washington, D. C.
MECHANISM OF OPERATION AND DESIGN CONSIDERATIONS FOR SURFACE ACOUSTIC WAVE DEVICE VAPOR SENSORS Progress Report, Oct. 1982 - Oct. 1983
H. Wohltjen 23 Apr. 1984 45 p
(AD-A141537; AD-E000568; NRL-MR-5314) Avail: NTIS HC A03/MF A01 CSCL 14/2

Surface acoustic wave (SAW) devices offer many attractive features for application as vapor phase chemical microsensors. This paper describes the characteristics of SAW devices and techniques by which they can be employed as vapor sensors. The perturbation of SAW amplitude and velocity by polymeric coating films was investigated both theoretically and experimentally. High sensitivity can be achieved when the device is used as the resonating element in a delay line oscillator circuit. A simple equation has been developed from theoretical considerations which offers reasonably accurate quantitative predictions of SAW Device frequency shifts when subjected to a given mass loading. In this mode the SAW device behaves in a fashion very similar to conventional bulk wave quartz crystal microbalance except that the sensitivity can be several orders of magnitude higher and the device size can be several orders of magnitude smaller. Detection of mass changes of less than 1 femtogram by a SAW device having a surface area of 0.0001 square cm. is theoretically possible. GRA

N84-29196# Department of the Navy, Washington, D. C.
ORGANOPHOSPHORUS SELECTIVE ION MOBILITY SPECTROMETER Patent Application
H. Wohltjen, inventor (to Navy) Filed 17 Feb. 1984 25 p
(AD-D011010; US-Patent-Appl-SN-581398) Avail: NTIS HC A02/MF A01 CSCL 14/2

This abstract discloses an ion mobility spectrometer for analysis of a gaseous sample wherein only nitrogen and phosphorus containing molecules of the sample are ionized. The spectrometer is of the type having an ion source for ionizing the sample gas and a shutter for gating ions into a drift region, wherein an electric field gradient exists. The ion source includes a bead which comprises a thermally stable material, such as a ceramic or glass, having an alkali metal compound on its surface. The bead is immersed in a gaseous mixture of hydrogen and air, and is heated to a temperature of 200-1000 C. The bead selectively ionizes phosphorus and nitrogen containing molecules of the sample upon contact with the bead. GRA

N84-29197# Department of the Air Force, Washington, D.C.
TOTAL TEMPERATURE PROBE BUFFER AMPLIFIER Patent Application
W. E. Ott, inventor (to Air Force) Filed 16 Feb. 1984 12 p
(AD-D011037; US-Patent-Appl-SN-580979) Avail: NTIS HC A02/MF A01 CSCL 14/2

The elimination of undesirable thermally induced changes of electrical characteristics of signal components is accomplished three operational amplifier circuits. The first operational amplifier provides electrical power to a system critical component and produces a reference output signal composed of the desirable function produced by the system critical components plus the undesirable thermally induced signal components produced by the change of the electrical characteristics of two identical lead wires connected to the system critical component. The second operational amplifier circuit senses the voltage drop in one of the two identical lead wires attached to the critical component. The second operation amplifier produces a sensing output signal that changes in value with the undesirable thermally induced changes of the electrical characteristics of one of the lead wires. Since the two lead wires are identical in resistance characteristics the sensing output signal varies proportionally with the total undesirable electrical signal components encountered. GRA

N84-29198# Department of the Navy, Washington, D. C.
SPECTRUM ANALYZER AND ANALYSIS METHOD FOR MEASURING POWER AND WAVELENGTH OF ELECTROMAGNETIC RADIATION Patent Application
F. M. Mako, J. A. Pasour, and C. W. Roberson, inventors (to Navy) Filed 24 Feb. 1984 22 p
(AD-D011044; US-Patent-Appl-SN-583536) Avail: NTIS HC A02/MF A01 CSCL 14/2

A spectrum analyzer for analyzing electromagnetic radiation which may be utilized to determine the radiation wavelength and power is described. The analyzer includes a gas filled chamber which has a collimating lens through which radiation is injected, and a reflective plate that reflects the radiation back toward the lens. A standing wave is created within the chamber having spatially periodic peaks. The chamber gas pressure is regulated to a pressure such that gas breakdown occurs, thereby generating a light pattern at each standing wave peak. The patterns are then photographed, and the patterns' diameters and spacing are measured from the resulting photograph. From the spacing and diameter obtained, wavelength and power may be calculated. Author (GRA)

N84-29199# Department of the Army, Washington, D. C.
A VOLTMETER FOR REMOTELY SENSING HIGH VOLTAGES Patent Application
H. W. Greene, J. D. Holder, and T. G. Roberts, inventors (to Army) Filed 12 Mar. 1984 10 p
(AD-D011046; US-Patent-Appl-SN-588488) Avail: NTIS HC A02/MF A01 CSCL 14/2

A passive voltmeter that measures pulses of high voltage by periodically discharging a condensor through a spark gap is presented. The frequency at which the spark gap breaks down is a function of the voltage being measured and is detected and displayed in volts. Radioactive material within the chamber is used to insure a constant breakdown voltage by supplying the necessary free electrons. This insures constant breakdown time for the arc with minimum jitter. Author (GRA)

N84-29200# California Univ., Livermore. Lawrence Livermore Lab.
EDGE BLURRING IN STACKED X-RAY FILM SCREEN COMBINATIONS
J. W. Lyle 6 Feb. 1984 11 p
(Contract W-7405-eng-48)
(DE84-009658; UCID-19995) Avail: NTIS HC A02/MF A01

The sensitivity and spatial resolution of stacked film screens for bremsstrahlung flash radiography of impliding, dense metal shells requires improvement. The spreading of the x-ray shadow of the edge of a uranium block in two film and screen combinations was measured. The SANDYL computer code, which models photon and electron scattering was employed to calculate the theoretical edge spreading in an array of films and screens. Experimentally, the uranium edge was spread to a width of 1.7 mm in the combination 0.15-mm-Ta/NDT9-XAR5, and 1.5 mm in the combination 0.25-mm-Ta/NDT6-XAR5. The theoretical calculation agreed with these results. DOE

N84-29201# California Univ., Livermore. Lawrence Livermore Lab.
NEW TECHNIQUE TO IMPROVE THE ACCURACY OF ALBEDO NEUTRON DOSIMETER EVALUATIONS
Dale E. Hankins 1984 6 p refs Presented at the 6th Congr. of the Intern. Radiation Protection Assoc., Berlin, 7-12 May 1984
(Contract W-7405-eng-48)
(DE84-002458; UCRL-88391; CONF-840512-6) Avail: NTIS HC A02/MF A01

The calibration factor for albedo neutron dosimeters varies greatly depending upon the energy of the neutrons in the exposure. Calibration results obtained over an eight-year period at each Lawrence Livermore National Laboratory facility where neutron exposure may occur were reviewed. A stronger relationship than expected was found between the ratio of the readings of the 9-in. to 3-in. spheres and the percent thermal. Readings from personnel

and albedo badges were reviewed. The readings were consistent with the use of a calibration factor for the albedo dosimeter which varies with changes in the ratio of the personnel and albedo dosimeter TLD readings. DOE

N84-29202# Stanford Linear Accelerator Center, Calif.
LARGE AREA SPARK COUNTER WITH FINE TIME AND POSITION RESOLUTION
A. Ogawa, N. Fujiwara, Yu. N. Pestov, and R. Sugahara Mar. 1984 4 p refs Presented at the Intern. Conf. on Instrumentation for Colling Beam Phys., Novosibirsk, USSR, 15-21 Mar. 1984 Sponsored in part by the Japan-US Cooperative Research Project on High Energy Physics
(Contract DE-AC03-76SF-00515)
(DE84-008203; SU-SLAC-PUB-3299; CONF-840396-1) Avail: NTIS HC A02/MF A01

The key properties of spark counters include their capability of precision timing (at the sub 100 ps level) and of measuring the position of the charged particle to high accuracy. At SLAC a program to develop these devices for use in high energy physics experiments involving large detectors was undertaken. A spark counter of size 1.2 m x 0.1 m was constructed and has been operating continuously in a test setup for several months. Some details of its construction and its properties as a particle detector are reported. DOE

N84-29203# California Univ., Livermore. Lawrence Livermore Lab.
HIGH IMAGE QUALITY SUB 100 PICOSECOND GATED FRAMING CAMERA DEVELOPMENT
R. H. Price and J. D. Wiewald 17 Nov. 1983 10 p refs Presented at Intern. Congr. on Appl. of Lasers and Electro-optics, Los Angeles, 14 Nov. 1983
(Contract W-7405-eng-48)
(DE84-008326; UCRL-89569; CONF-831195-7) Avail: NTIS HC A02/MF A01

The symmetry and hydrodynamic stability of imploding fuel capsules were studied. Framed X-radiography of 10 to 100 ps duration, excellent image quality, minimum geometrical distortion dynamic range greater than 1000, and more than 200 X 200 pixels are required for this application. Progress on a gated proximity focused intensifier which meets these requirements is presented. DOE

N84-29204# Technische Univ., Berlin (West Germany). Inst. fuer Maschinenkonstruktion.
SHAFT-HUB DEFORMATION ANALYSIS BY MEANS OF HOLOGRAPHY [WELLE-NABE-VERFORMUNGSANALYSE MITTELS HOLOGAFIE]
Wolfgang Beitz, ed. and Dietrich Juckenack Jan. 1983 239 p refs In GERMAN Sponsored by Deutschen Forschungsgemeinschaft
(Schr-Konstr.Tech-5; ISBN-3-7983-0857-8; ISSN-0173-0509) Avail: NTIS HC A11/MF A01

Deformation analyses were performed on friction- and form-determined shaft-hub connections using holographic interferometry. The holographic measurement technique is explained. The deformation analyses are used to determine the load distribution and measures to enhance the load. For form-determined connections, the reflex-layer technique was also used to determine buckling in cases of torsion. Advice for the performance of such deformation analyses are given for construction, testing, and design of shaft-hub connections. Author (ESA)

N84-29205# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany).
THE CHARACTERISTICS OF THE CYLINDRICAL DRIFT CHAMBERS OF THE DETECTOR CELLO: INVESTIGATION WITH MUONS FROM HIGH ALTITUDE COSMIC RAYS Thesis [DIE EIGENSCHAFTEN DER ZYLINDRISCHEN DRIFTKAMMERN DES DETEKTORS CELLO: UNTERSUCHUNG MIT MYONEN AUS DER KOSMISCHEN HOEHENSTRAHLUNG]
Uwe Binder Dec. 1983 127 p refs
(MPI-PAE/Exp.E1.125) Avail: NTIS HC A07/MF A01

The characteristics of the cylindrical drift chambers of the CELLO detector were investigated using muons from cosmic radiation. An iterative procedure for the parameterization of the time-distance relation is presented. The numerical approximation obtained with this procedure agrees to within 50 micron with the experimental nonlinear relation. The chamber characteristics are determined with and without magnetic field (B = 1.32 T). A long detection probability plateau is obtained with an argon/ethane 50%/50% gas mixture. An average spatial resolution of 170 microns is obtained without B. It is found that the drift chambers react when the electrons from the first 2 to 3 primary ionizations reach the signal wire. The average response probability is 97.5%; the over response probability is 3.6%. The average spatial resolution with B is 170 microns; the response probability is 98.3%. Author (ESA)

N84-29206# Fraunhofer-Inst. fuer Angewandte Festkoerperphysik, Freiburg (West Germany).
STUDY OF DRY RESISTANT TECHNIQUES FOR ELECTRON BEAM LITHOGRAPHY Final Report, Dec. 1982
Christian Fritzsche and Wolfram Rothemund Bonn Bundesministerium fuer Forschung und Technolgie Apr. 1984 63 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-037; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

Two techniques for deposition of thin masking films for microlithography are dealt with. Deposition of polymer patterns by electron or ion beam induced polymerization and plasma deposition of polymer films which can be patterned by irradiation and subsequent plasma development were examined. Physical and chemical problems of film growth were studied and deposition rate and etch resistance were measured. Results show that deposition of patterned films by ion beam induced polymerization promises sufficiently high resolution and processing speed for practical applications. Plasma deposition of radiation sensitive polymers could provide a lithographic technique if the process of plasma development is adequately matched to the processes of deposition and irradiation. Author (ESA)

N84-28839# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF SPACE HOLOGRAPHY
V. Tuchkevich and S. Gurevich *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 59-62 Transl. into ENGLISH from Pravda (USSR), 1 Dec. 1983 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28853# Joint Publications Research Service, Arlington, Va.
THREE-ELEMENT RADIOINTERFEROMETER WITH VERY LONG BASELINES Abstract Only
L. I. Matveyenko, R. Z. Sagdeyev, V. I. Kostenko, L. R. Kogan, Y. P. Molotov, S. P. Ignatov, A. B. Severnyy, I. G. Moiseyev, V. A. Yefanov, and R. L. Sorochenko *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 72 Transl. into ENGLISH from Pisma Astron. Zh.(USSR), v. 9, no. 7, Jul. 1983 p 415-420 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28875# Joint Publications Research Service, Arlington, Va.
METHOD FOR CREATING SYNTHESIZED IMAGES USING DIAZO COLOR FILMS Abstract Only
R. Kaczinski *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 107 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 100-102 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

36 LASERS AND MASERS

Includes parametric amplifiers.

N84-29207*# Lincoln Lab., Mass. Inst. of Tech., Lexington.
LEAD SALT DIODE LASERS AND DEVELOPMENT OF TUNABLE

SOLID STATE LASERS FOR REMOTE SENSING Semiannual Progress Report
C. Freed and J. W. Bielinski Jul. 1984 22 p refs Original doc. contains color illustrations
(Grant NAG-1-164)
(NASA-CR-173783; NAS 1.26:173783) Avail: NTIS HC A02/MF A01 CSCL 20E

Extensive studies of the output characteristics of single quantum well lead-telluride lasers developed at the General Motors Research Laboratories were carried out. Threshold currents, output powers and line structures were measured as a function of temperature. Very low-current lasing thresholds, record high operating temperatures and over 30% tuning ranges were achieved. Excellent reproducibilities, good far-field patterns and reasonable linewidths (approx. 500 kHz) were found. Author

N84-29208# Imperial Coll. of Science and Technology, London (England).
MATHEMATICAL MODELLING OF LASER/MATERIAL INTERACTIONS Final Report, 1 Jan. 1982 - 1 Nov. 1983
William M. Steen and Jyoti Mazumder 25 Nov. 1983 92 p
(Grant AF-AFOSR-0076-82; AF Proj. 2301)
(AD-A141096; EOARD-TR-84-16) Avail: NTIS HC A05/MF A01 CSCL 12/1

The development of a detailed finite difference model of laser/material heat transfer is described. The model allows for thermal conduction, surface convection and radiation, variation in thermal properties, latent heat, and keyhole formation and has some allowance for convection in the melt pool. It accounts for plasma interference but does not discuss the physical mechanisms involved within a keyhole. Some applications are described. Author (GRA)

N84-29209# City Coll. of the City Univ. of New York. Dept. of Physics.
SEMICONDUCTORS INVESTIGATED BY TIME RESOLVED RAMAN ABSORPTION AND PHOTOLUMINESCENCE SPECTROSCOPY USING FEMTOSECOND AND PICOSECOND LASER TECHNIQUES Progress Report, 1 Dec. 1982 - 1 Jan. 1984
R. R. Alfano and A. G. Doukas Mar. 1984 10 p
(Contract F49620-83-C-0027)
(AD-A141381; AFOSR-84-0333TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

We report on the research performed during the period 1982-1983 under the auspices of AFOSR. The research effort follows two directions: (1) laser development: subpicosecond laser, application of anti-resonant cavity to Nd:glass, study of the emerald laser, and study of a new mode-locking dye for shorter pulses. (2) Time-resolved fluorescence and absorption studies of CdCr-2Se4, GaAs and Ga(0,5)In(0.5)P with the goal to understand the interaction and kinetics of photogenerated carriers and basic assignments of the valence-conduction band transitions (Cd-Cr2Se4). We have also investigated the dynamics of semi-insulating CdSe. Finally we have continued the research on radiation damage (neutrons and protons) in CdSe and GaAs. Author (GRA)

N84-29210# Alabama Univ., Huntsville.
OPERATING CONDITIONS FOR THE HYDROGEN/DEUTERIUM TRIPLET LASERS
T. A. Barr, Jr., W. B. McKnight, and B. J. Rogers (Army Missile Command, Redstone Arsenal, Ala.) 1984 7 p
(AD-A141388) Avail: NTIS HC A02/MF A01 CSCL 05/4

This report describes the conditions under which hydrogen/deuterium lasers occur and shows how this leads to a plausible explanation for their existence. GRA

N84-29211# Yale Univ., New Haven, Conn. Dept. of Applied Physics.
ELECTRON IMPACT CROSS SECTIONS FOR MOLECULAR LASERS Final Technical Report, 1 Jul. 1975 - 30 Jun. 1983
S. F. Wong 27 Apr. 1984 33 p
(Contract N00014-76-C-0078)
(AD-A141754) Avail: NTIS HC A03/MF A01 CSCL 20/8

This project deals with electron impact experiments on atoms and molecules relevant to the development of the N2-CO2 and rare-gas halide lasers. Cross sections for state-of-state transitions in a variety of collisional processes (rotational, vibrational, and electronic excitation; dissociative attachment) have been determined in the first 4 eV of threshold and are generally found to exhibit great enhancement attributable to resonances. Highlights of the methods of cross-section measurement are also presented. Author (GRA)

N84-29212# Michigan State Univ., East Lansing. Div. of Engineering Research.
COMPUTER MODELING OF PULSED CHEMICAL LASERS Final Report, 1 Nov. 1979 - 31 Oct. 1983
R. L. Kerber 31 Dec. 1983 278 p
(Grant AF-AFOSR-0003-80; AF Proj. 2303)
(AD-A141889; MSU-ENGR-84-004; AFOSR-84-0424TR) Avail: NTIS HC A13/MF A01 CSCL 20/5

A computer modeling study of pulsed H2+F2 and D2+F2 chemical lasers has been conducted. This work was directed toward understanding the role of kinetic rotational relaxation and vibrational-rotational relaxation mechanisms in HF and DF lasers. This study resulted in very comprehensive computer models that could predict spectral characteristics of pulsed laser performance using kinetics rate equation data and experimental conditions. In addition, experiments were conducted on a flash initiated pulsed H2+F2 laser facility to generate data to compare with the models developed in this study. Models were also developed that demonstrated the performance of pulsed laser driven amplifiers and optical resonance transfer lasers. Finally, simple models were constructed that permit efficient prediction of pulse energy and pulse power. Author (GRA)

N84-29213# Mathematical Sciences Northwest, Inc., San Marcos, Calif.
TECHNOLOGY DEVELOPMENT FOR TAPERED-WIGGLER FREE-ELECTRON LASERS Final Report, 1 Jul. 1982 - 29 Feb. 1984
J. Slater Apr. 1984 164 p
(Contract N00014-82-C-0704; DARPA Order 3818)
(AD-A142319) Avail: NTIS HC A08/MF A01 CSCL 20/5

This report addresses technology required for high-power visible free-electron lasers. The work follows logically from recent demonstrations of electron kinetic energy conversion to optical energy in tapered-wiggler free-electron lasers (FEL). The tapered-wiggler FEL differs from the first demonstrated nontaperod version in that it allows a much larger fraction of electron energy to be converted to optical energy in a single pass through the wiggler magnet. This conversion, now demonstrated as high as 4 percent, may lead to high-power, high-efficiency devices if an e-beam recovery stage is added downstream of the wiggler. The technology addressed is that necessary for the transition from the current 10 micron amplifiers to 0.5 micron oscillators. These two regimes differ dramatically in two ways. First, the physics of the oscillator is more complex than for the existing low-gain amplifiers because the optical wave in the oscillator is not predetermined by an injector. Second, a higher level of electron and photon beam control is required to get proper physical overlap of these beams at shorter wavelengths. GRA

N84-29214# Department of the Navy, Washington, D. C.
EXTENDED LASER SENSOR Patent Application
S. J. Petuchowski and T. G. Giallorenzi, inventors (to Navy) Filed 25 Jan. 1984 20 p
(AD-D011011; US-Patent-Appl-SN-573752) Avail: NTIS HC A02/MF A01 CSCL 17/8

Document describes an extended laser sensor including a laser with an optical gain lasing medium optically coupled to an optical resonant cavity including reference and sensor arms. Optical path length variations in the sensor arm induced by an incident physical field modulate the operating parameters of the laser. The

field is sensed by monitoring these modulated operating parameters. Author (GRA)

N84-29215# California Univ., Livermore. Lawrence Livermore Lab.
COMPUTER DESIGN AND OPTIMIZATION OF THE ACTIVE ROTARY FLUX COMPRESSOR
D. Eimerl and E. J. Goodwin 6 Dec. 1983 73 p refs
(Contract W-7405-eng-48)
(DE84-010069; UCRL-53472) Avail: NTIS HC A04/MF A01

The active rotary flux compressor (ARFC) is a high power (10 GW), short pulse length (1 ms) power supply which utilizes magnetic flux compression. A new technology is considered as a power supply for high energy lasers used in experiments in inertial confinement fusion (ICF). ARFC model was developed and normalized. The model predicts all the relevant electrical and mechanical properties of the machine and simulates its operation in an ICF laser system. The model indicates the ARFC design with optimum performance, in the system context, and maximizes various figures of merit. It is indicated that an ARFC with a rotor approximately 3 m long and 50 cm in radius is capable of delivering 10 MJ of electrical energy to the flashlamp bank. DOE

N84-29216# California Univ., Livermore. Lawrence Livermore Lab.
LASER DAMAGE IN POROUS-SILICA ANTIREFLECTION FILMS
W. H. Lowdermilk, J. G. Wilder, N. J. Brown, C. A. Gunderson, D. Milam, F. Rainer, and M. C. Staggs 1 Mar. 1984 7 p refs Presented at the Symp. on Opt. Mater. for High Power Lasers, Boulder, Colo., 14-16 Nov. 1983
(Contract W-7405-eng-48)
(DE84-009535; UCRL-89863; CONF-8311146-1) Avail: NTIS HC A02/MF A01

Controlled 355-nm, 0.6-ns pulses were used to measure laser-damage thresholds of porous-silica antireflection coatings deposited from a polymer solution onto fused silica substrates. For 118 coatings with optical thickness of 500 to 600 nm, the median threshold was less than 2 J/cm(2), and thresholds were not systematically dependent on either the level of filtration of the coating solution or the procedure used to clean the substrates. For coatings 87 to 90 nm in optical thickness, thresholds were as large as 9 J/cm(2), which is the threshold of the bare polished surfaces of the fused silica substrates. The data suggests that carbon residues from the coating solution are responsible for damage in the thicker coatings. DOE

N84-29217# Stanford Univ., Calif. Lab. for Physics.
AUGER ELECTRON PUMPING OF SHORT WAVELENGTH LASERS Final Report, 9 Feb. - 30 Sep. 1983
S. E. Harris and J. F. Young Dec. 1983 15 p refs
(Contract DE-AC08-83DP-40178)
(DE84-009240; DOE/DP-40178/1) Avail: NTIS HC A02/MF A01

The results of approach for using laser produced incoherent soft X rays for the production of metastable states of neutral alkali metals are examined. The key idea is to use an absorber species, such as Ne, to stop the X-rays and to produce photoelectrons and Auger electrons which then excite the desired species. Electron densities are created in excess of 10(16) cm(-3) with a mean temperature of 45 eV in a 600 ps pulse using an input laser energy of less than 100 mJ. This electron source is used to create large populations of lithium quartet metastables; the lifetime of this state is also measured. DOE

N84-29218# Rochester Univ., N. Y. Lab. for Laser Energetics.
INVESTIGATION OF SOL-GEL ANTIREFLECTION COATINGS
A. Schmid, M. Guardalben, and T. Chipp Mar. 1984 23 p refs
(Contract DE-AC08-80DP-40124)
(DE84-008381; DOE/DP-40124/21) Avail: NTIS HC A02/MF A01

Very high power laser systems present material design challenges which often approach the inherent optical survival strength of components. Optical coatings in the UV region suffer from anomalously high absorption and scattering in the deposited layers. The losses caused by these effects are often unacceptable or, in the case of absorption, usually fatal to the absorbing coatings. No metals exist that have high enough reflectivities in the UV to serve as uncoated mirrors as they normally do in the CO2 region of the infrared. Adequate multilayer dielectric coatings and reflection suppressing antireflective coatings in that wavelength range are important for the development and utilization of UV lasers. Antireflective properties of gradient index designs were rediscovered and their potential for resolving UV laser design difficulties was tested. The antireflective properties are attained on glass or fused silica surfaces by chemical surface treatments. DOE 19

N84-29219# Los Alamos Scientific Lab., N. Mex. Chemistry Div.
CAPABILITIES OF BROADLY-TUNABLE FREE-ELECTRON LASERS
Brian E. Newnam 1984 19 p refs Presented at the SPIE Tech. Symp. and Instrument Exhibit, Los Angeles, 26-27 Jan. 1984
(Contract W-7405-eng-36)
(DE84-009998; LA-UR-84-1104; CONF-840139-4) Avail: NTIS HC A02/MF A01

Experimental demonstrations of free electron laser oscillators which are attracting the attention of research and industrial chemists are discussed. The inherent properties of these photon sources, the operating parameters of successful oscillators, and potential chemical applications are reviewed. DOE

N84-29220# Research Inst. of National Defence, Stockholm (Sweden).
CUTTING OF FIBER REINFORCED POLYMERS WITH A CW CO-2 LASER: AN EXPERIMENTAL STUDY
Mats Flaum Jan. 1984 53 p refs In SWEDISH; ENGLISH summary
(Contract STU-80-4464)
(FOA-C-20527-D9; ISSN-0347-3694) Avail: NTIS HC A04/MF A01

A 250 W CO2 CW laser cutter auxiliary equipment, especially the gas nozzle with novel features for the protection gas (air, nitrogen, argon, helium, or carbon dioxide) are described. Cutting results, e.g., the dependance of maximum cutting speed on different parameters, are reported. A simple thermic model is given for the description of the influence of anisotropy. A method for cut quality diagnosis is outlined and preliminary tests presented. Good cutting results are noted for aramid fibers/epoxy and glass fibers/epoxy composites while boron fibers/epoxy and carbon fibers/epoxy were hard to process. As protection gas, carbon dioxide is preferable for glass fibers, and helium for boron fibers. Author (ESA)

N84-29221# European Space Agency, Paris (France).
CALCULATION OF THE PERFORMANCE OF AN RF EXCITED TRANSVERSE FLOW CO2 LASER
Holger Jacoby May 1984 96 p refs Transl. into ENGLISH of "Berechnung der Leistungsdaten eines Quergestroemten CO2-Lasers mit Hochfrequenzanregung" rept. DFVLR-FB-83-06 DFVLR, Stuttgart, 1983 Original language document was announced as N84-14514
(ESA-TT-832; DFVLR-FB-83-06) Avail: NTIS HC A05/MF A01; original German version available from DFVLR, Cologne DM 27

A theoretical model based on a kinetic four temperature model and the gasdynamic conservation equations for the prediction of the performance of an electrically excited transverse flow CO2 laser is described. The effects of gas mixture, flow velocity, pressure, temperature, and the characteristic properties of the electric discharge on small signal gain and saturation intensity were investigated. Good agreement is obtained between theory and the experimental measurements performed with an RF-excited transverse flow CO2 laser. Author (ESA)

N84-29290# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DESIGN AND OPERATION MODE OF Nd:YAP LASERS IN

MODULAR TRANSPORTABLE LASER RANGING SYSTEM (MTLRS) [AUFBAU UND FUNKTIONSWEISE DES Nd:YAP-LASERS IM MODULAREN TRANSPORTABLEN LASER-ENTFERNUNGSMESSYSTEM (MTLRS)]
Heinz Puell and Peter Wilson *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 91 1983 p 49-54 refs In GERMAN; ENGLISH and FRENCH summary (For primary document see N84-29286 19-43)
Avail: NTIS HC A05/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N84-29222 British Library Lending Div., Boston Spa (England).
VARIATION IN COEFFICIENT ACCOUNTING FOR INFLUENCE OF EXTERNAL ZONES WITH VARIATION IN CONTACT FRICTION CONDITIONS
K. M. Kolmakov and N. A. Chelyshev 26 Apr. 1984 9 p refs Transl. into ENGLISH from Izv. (USSR), no. 8, 1983 p 29-33 (BLL-M-35596-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Experiments established that the coefficient accounting for the influence of the external zones, n'' sigma and experimental stress state coefficient, n(exp)sigma are independent of the amount of deformation but dependent on the state of the contact surface, the indicated coefficients increasing with increase in friction forces. Estimation of the influence of the external zones in the form of coefficient n'' sigma is uncertain; coefficient n(exp)sigma mu where mu represents the coefficient of friction, being more suitable for this purpose. Author

N84-29223*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFICIENCY OF NONSTANDARD AND HIGH CONTACT RATIO INVOLUTE SPUR GEARS
Neil E. Anderson and Stuart H. Loewenthal 1984 35 p refs Proposed for presentation at the 4th Intern. Power Transmission and Gearing Conf., Cambridge, Mass., 10-12 Oct. 1984; sponsored by ASME Prepared in cooperation with Army Research and Technology Labs., Cleveland
(NASA-TM-83725; E-2173; NAS 1.15:83725; USAAVSCOM-TR-84-C-9) Avail: NTIS HC A03/MF A01 CSCL 13I

A power loss prediction was extended to include involute spur gears of nonstandard proportions. The method is used to analyze the effects of modified addendum, tooth thickness, and gear center distance in addition to the parameters previously considered which included gear diameter, pitch, pressure angle, face width, oil viscosity, speed, and torque. Particular emphasis was placed on high contact ratio gearing (contact ratios greater than two). Despite their higher sliding velocities, high contact ratio gears are designed to levels of efficiency comparable to those of conventional gears while retaining their advantages through proper selection of gear geometry. Author

N84-29224*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LUBRICANT JET FLOW PHENOMENA IN SPUR AND HELICAL GEARS WITH MODIFIED CENTER DISTANCES AND/OR ADDENDUMS FOR OUT-OF-MESH CONDITIONS
Lee S. Akin and Dennis P. Townsend [1983] 27 p refs Prepared for presentation at the 4th Intern. Power Transmission and Gearing Conf., Cambridge, Mass., 10-12 Oct. 1984; sponsored by ASME (NASA-TM-83723; E-2190; NAS 1.15:83723) Avail: NTIS HC A03/MF A01 CSCL 13I

Out-of-mesh jet lubrication of gears was examined. The pinion impingement cycle was described briefly. An analysis was developed for the lubricant jet flow in the out-of-mesh condition. The analysis provides for the inclusion of modified center distances and modified addendums. Equations were generated for the limit values of variables necessary to remove the severe limitations to facilitate computer analysis. A computer program was designed using these limit formulas to prevent negative impingement (missing) on the pinion. R.S.F.

N84-29225*# National Aeronautics and Space Administration, Washington, D. C.
DYNAMIC PROPERTY STUDIES OF STERLING ENGINES
Y. Tani, M. Seibara, K. Takenai, and W. Yamaguchi Feb. 1984 12 p refs Transl. into ENGLISH from Nihon Kikai Gakkai Koen Ronbunshu (Japan), no. 810-5, 1981 p 132-134 Transl. by Scientific Translations, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77719; NAS 1.15:77719) Avail: NTIS HC A02/MF A01 CSCL 13I

A description is given of the results of dynamic property tests that were carried out using a trial produced prototype of a 50 KW Sterling engine. The features of the engine are shown graphically. A high thermal efficiency is found in the low rotation region. Author

N84-29226*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OPERATING CHARACTERISTICS OF A THREE-PIECE-INNER-RING LARGE-BORE ROLLER BEARING TO SPEEDS OF 3 MILLION DN
Fredrick T. Schuller Aug. 1984 21 p refs
(NASA-TP-2355; E-1806; NAS 1.60:2355) Avail: NTIS HC A02/MF A01 CSCL 13I

A 118 mm bore roller bearing with a three piece inner ring ran successfully at 300,000 DN for 20 hr. Provisions were made for lubrication and cooling through the inner ring. In some tests the outer ring was also cooled. Power loss within the bearing increased with both speed and total oil flow rate to the inner ring. Outer ring temperature decreased by as much as 22 K (40 F) when outer ring cooling was employed whereas inner ring temperature remained essentially constant. Cage slip was greatly reduced or even eliminated by using a bearing with a very tight clearance at operating speed. A three piece inner ring bearing had higher inner ring temperatures and less temperature difference between the inner and outer rings than a conventional one piece inner ring bearing. Author

N84-29227# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
AN ALGORITHM FOR SEAM TRACKING APPLICATIONS Interim Technical Report
P. K. Khosla, C. P. Neuman, and F. B. Prinz May 1984 39 p
(AD-A141705; CMU-RI-TR-84-6) Avail: NTIS HC A03/MF A01 CSCL 12/1

Seam tracking is currently accomplished by special features of the robot and a priori knowledge of seam geometry. This paper demonstrates the feasibility of tracking a seam in real-time. A general-purpose seam tracking algorithm is developed for implementation on a robot with six degrees-of-freedom. The algorithm is motivated by a physical interpretation of the t sub 6 and dt sub 6 matrices, and the assumption that three dimensional seam data are available. In the past, dT sub s matrix and inverse Jacobian solutions have been used to compute the differential changes in the joint angles. By using the inverse Jacobian, an iterative algorithm is introduced to compute both large and small changes in the joint variables. The versatile seam tracking algorithm can be applied to a multitude of robotic seam tracking activities such as gluing, surface grinding and flame cutting. Author (GRA)

N84-29228# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
ROBOTIC SEAM TRACKING Interim Report
F. B. Prinz and K. T. Gunnarsson Apr. 1984 16 p
(AD-A141769; CMU-RI-TR-84-10) Avail: NTIS HC A02/MF A01 CSCL 20/6

The principles of contact and non-contact sensors for robotic

seam tracking are reviewed. Non-contacting sensors are based on either an electromagnetic or an acoustic principle. Electromagnetic sensors in the low frequency regime induce eddy currents which can be used for the detection of surface discontinuities. In the high frequency regime (visual spectrum), laser light stripe systems in connection with vision cameras can be successfully used for seam location. Other optical systems and infrared thermography are briefly described. Alternatively, acoustic systems using time of flight measurements can be applied to the characterization of seams. Finally, through the arc systems and their limitations for seam tracking are outlined. The need for off-line programming techniques for path planning with seam tracking devices is emphasized. Author (GRA)

N84-29229# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
PATH RELAXATION: PATH PLANNING FOR A MOBILE ROBOT Interim Technical Report
C. E. Thorpe Apr. 1984 32 p
(Contract N00014-81-K-0503)
(AD-A141779; CMU-RI-TR-84-5) Avail: NTIS HC A03/MF A01 CSCL 12/1

Path Relaxation is a method of planning safe paths around obstacles for mobile robots. It works in two steps: a global grid search that finds a rough path, followed by a local relaxation step that adjusts each node on the path to lower the overall path cost. The representation used by Path Relaxation allows an explicit tradeoff among length of path, clearance away from obstacles, and distance traveled through unmapped areas. Author (GRA)

N84-29230# Woods Hole Oceanographic Institution, Mass.
BOTTOM-MOUNTED PROFILING WINCH
R. G. Walden and C. W. Collins, Jr. Mar. 1984 18 p
(Contract N00014-82-C-0019)
(AD-A141808; AD-E800931; WHOI-84-12) Avail: NTIS HC A02/MF A01 CSCL 08/10

A winch has been developed which can be free-dropped to the ocean bottom in full ocean depths. The winch is powered by self-contained batteries and can be programmed to cycle self-recording instruments from close to the bottom to 100 meters above the bottom continuously or in steps. A typical scenario is envisioned as one complete cycle per day for one year with the instruments pausing each five meters for two minutes while measurements of current, temperature and conductivity are made. The upper section of the tripod contains the winch and instrumentation and is recovered by sending an acoustic command to a release mechanism allowing it to come to the surface. GRA

N84-29231# Naval Civil Engineering Lab., Port Hueneme, Calif.
SEAWATER HYDRAULICS: DEVELOPMENT AND EVALUATION OF AN EXPERIMENTAL DIVER TOOL SYSTEM Final Technical Report, Oct. 1980 - Sep. 1982
S. A. Black, K. Tate, and T. Conley Feb. 1984 84 p
(AD-A142032; NCEL-TR-907) Avail: NTIS HC A05/MF A01 CSCL 13/7

The Naval Civil Engineering Laboratory has developed a diver-operated hydraulic tool system that uses seawater as the working fluid. The tool system consists of a diesel-driven hydraulic power source, a rotary impact wrench, and a rotary propeller cleaning brush. The rotary impact wrench is powered by an improved 3-hp reversible vane motor; the propeller cleaning brush is powered by a unidirectional vane motor. Both motors effectively provided power to perform the intended tasks. After 200 hours of operation, the reversible motor provided 3 hp of output at greater than 70% overall efficiency. Vane springs failed and were replaced after operating for 100 hours. The impact wrench delivered over 1,100 ft-lb of torque to a 1-inch-diam bolt in less than 7 seconds when used by a diver. Preliminary diver tests showed that the propeller cleaning brush functioned exceptionally well. The diesel driven power source can deliver seawater at 12 gpm and 2,000 psi. This report presents the results of the test and evaluation of this experimental tool system. GRA

N84-29232# Oak Ridge National Lab., Tenn. Conservation and Renewable Energy Program.
ORNL RESEARCH PROGRAMS ON REFRIGERATION SYSTEMS, ECUT MATERIALS AND TRIBOLOGY
Roger S. Carlsmith 29 Feb. 1984 7 p refs
(Contract W-7405-eng-26)
(DE84-007542; DOE/NBM-4007542) Avail: NTIS HC A02/MF A01

A brief review of the research program is given including heat pumps, thermal insulation, and the materials and tribology projects of the Energy Conversion and Utilization Technologies Program at the Oak Ridge National Laboratories. DOE

N84-29233# Sandia Labs., Livermore, Calif. Joining Model Lab. Div.
OPTICAL AND ELECTRONIC METHODS FOR WELD ARC VIEWING
Scot J. Marburger Apr. 1984 13 p refs
(Contract DE-AC04-76DP-00789)
(DE84-009731; SAND-84-8650) Avail: NTIS HC A02/MF A01

A television based welding arc monitoring system consisting of focusing lenses, fiber bundle, color video camera, and color video monitor is described. The problems associated with weld arc imaging are discussed, and the guidelines used in developing the weld arc viewing system are presented. A video tape recording made during the deposition of several gas tungsten arc welds is also described. DOE

N84-29234# Rolls-Royce Ltd., Derby (England). Design Dept.
THE INITIAL MECHANICAL DESIGN OF HOT GAS TURBINE BLADING USING LIMITED INFORMATION
A. G. Dodd 29 Aug. 1983 27 p refs Presented at Metals Soc. Conf. on Designing with High Temp. Mater., Sheffield, Engl., 20-22 Sep. 1983
(PNR-90183; Reprint-896; DDR-1099) Avail: NTIS HC A03/MF A01

A method to outline rotor blade mechanical design of each gas turbine stage, specifying material choice, cross sectional areas, rim loads on disks and level of cooling technology required for commercially satisfactory life was devised. The method uses only the data available at the early stages of project design, simplifies constraints to allow rapid iteration, and is confined to defining an outline for further detailed design and analysis. Failure mechanisms are handled by choosing a temperature or stress for each radial position on a blade within creep and temperature criteria lines plotted on a stress against mean metal temperature field. Blades are optimized within this field by varying either cooling technology level or by changing cross sectional area to vary stress.
Author (ESA)

N84-29235# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
FABRICATION OF PRESSURE VESSELS FROM FIBER REINFORCED ALUMINUM BY ELECTROFORMING FOR SPACE APPLICATION Final Report, Feb. 1983
Richard Suchentrunk and Franz Gammel Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 171 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-009; ISSN-0170-1339) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33,50

Electroforming production processes for fiber reinforced metal matrix composites are investigated. A boron fiber reinforced aluminum pressure vessel was fabricated. It was designed as a hybrid construction (boron aluminum cylinder with titanium shells). This construction is necessary because the complete pressure vessel cannot be formed by winding technique, the high stiffness of the boron fibers being a hindrance. A mathematical model was used for optimization of the tank configuration and methods for pressure-tight and adherent connection of tank shell and cylinder were investigated and optimized. It is concluded that aluminum is interesting as metal matrix for space application components

because of its low specific weight, for rocket combustion chambers, waveguides, or satellite adapters. Author (ESA)

N84-29236# Krupp (Fried.) G.m.b.H., Essen (West Germany). Krupp Forschungsinst.
DESIGN, MANUFACTURE AND TESTS OF A LOCKING AND UNLOCKING MECHANISM, USING MEMORY ELEMENTS (VEM); LAYOUT, MANUFACTURE AND TESTING OF A TRACKING MECHANISM, USING MEMORY ELEMENTS FOR LOCKING/UNLOCKING AND DRIVING AND BEING SUITABLE FOR QUALIFICATION (NFMM) Final Report, Jan. 1979
Joachim Jorde and Hans-Georg Reiss Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 61 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-012; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

A locking/unlocking mechanism and a tracking mechanism using NiTi alloy memory elements as drives are presented. The power supply components, the drives, and the active parts were designed, manufactured and tested for spacecraft applications. Advantages in terms of simplicity, reliability and cost are emphasized. The memory elements are inexpensive to replace and can be reconditioned repeatedly at low cost. Author (ESA)

N84-29169# Rolls-Royce Ltd., Derby (England).
LOW ASPECT RATIO TURBINE DESIGN AT ROLLS-ROYCE
S. Morgan *In* Von Karman Inst. for Fluid Dyn. Secondary Flows and Endwall Boundary Layers in Axial Turbomachines 1984 89 p refs (For primary document see N84-29162 19-34)
Avail: NTIS HC A21/MF A01

N84-29341*# Spectrolab, Inc., Sylmar, Calif.
IMPROVED TECHNIQUES OF PARALLEL GAP WELDING AND MONITORING
N. Mardesich and M. S. Gillanders *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 228-234 ref (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 13I

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N84-29237# Wisconsin Univ., Madison. Mathematics Research Center.
STOCHASTIC MODELS FOR COMMON FAILURES OF COMPONENTS Technical Summary Report
B. Harris Mar. 1984 34 p
(Contract DAAG29-80-C-0041)
(AD-A141490; MRC-TSR-2659) Avail: NTIS HC A03/MF A01 CSCL 12/1

Much of the literature dealing with system failures assumes that individual subsystems or components are stochastically independent. In this report, some models that have been used for analyzing dependent failures are examined and one new time dependent stress-strength(loading) model is proposed. These models are of particular interest in the probabilistic risk assessment of nuclear reactors. GRA

N84-29238# California Univ., Berkeley. Lawrence Berkeley Lab. Accellerator and Fusion Research Div.
EFFECT OF MANUFACTURING ERRORS ON FIELD QUALITY OF THE LBL SSC DIPOLES
Robert B. Meuser Jan. 1984 10 p refs Presented at a Workshop on Accelerator Phys. Issues for a Superconducting Super Collider, Ann Arbor, Mich., 12-16 Dec. 1983
(Contract DE-AC03-76SF-00098)
(DE84-009224; LBL-17050; CONF-831264-13) Avail: NTIS HC A02/MF A01

A method is developed for determining the field aberrations resulting from specific kinds of manufacturing errors. This method is applied to the 40-mm i.d. dipoles under consideration at LBL, and also to similar ones with 30 and 50 mm i.d. The method is also applied to the CBA and Doubler/Saver magnets and the results compared with the measurements. The results obtained by this method are also compared with those obtained by assigning identical errors to the positions of the edges of all the coil sectors. DOE

N84-29239# Krupp Stahl A.G., Bochum (West Germany).
AUTOMATED DETECTION OF INTERNAL AND SURFACE DEFECTS IN MOVING STRIP Final Report, Dec. 1982
Klaus Priess, Guenther Coen (VDEH-Inst. fuer Angewandte Forschung GmbH), Peter Bohlaender (VDEH-Inst. fuer Angewandte Forschung GmbH), Roland Keck (VDEH-Inst. fuer Angewandte Forschung GmbH), Fritz Isselstein (VDEH-Inst. fuer Angewandte Forschung GmbH), and Ernst Luhn Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 121 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-079; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25,50

Detection of internal and surface defects in hot rolled wide metal strips is presented. Electromagnetic ultrasonic transducers (pulse echo technique) operating without couplants for generating Lamb waves at right angles to the moving strip (strip speed max 240 m/min.) were used to detect internal flaws. An automatic flaw detector controlled by a process computer was located on the outgoing side of a high capacity pickling line. A scanner, which scans the pickled strip at right angles at 1000 1/sec was used to detect surface flaws by measuring the reflection from the strip and the light scatter. Good differentiation is achieved between surface damage, stains, and impurities. A computer classifies the flaws according to length and width (log).
Author (ESA)

N84-29240# Technical Research Centre of Finland, Espoo. Instrument Lab.
WELD QUALITY MONITORING SYSTEM
Ari Nikkola, Kalervo Leino, and Karri Vartiainen Mar. 1984 43 p refs Sponsored by Nordic Industrial Fund and Finnish Ministry of Trade and Industry
(VTT-RR-263; ISBN-951-38-2015-7; ISSN-0358-5077) Avail: NTIS HC A03/MF A01

Ways of checking the quality of welds in mechanized gas metal arc welding by monitoring welding parameters are described. A system capable of monitoring welding energy, short-circuiting frequency, proportional arc duration and arc sound emission was developed. The sound emission monitoring and measuring system are discussed. Arc sound emission is correlated to weld defect formation. Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N84-29241# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technology.
LIMITING LOAD CAPACITY AND WELD MEASUREMENTS [NOSNOSC GRANICZNA I WYMIAROWANIE SPOIN]
Wlodzimierz Zowczak 1983 46 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

Potential uses of the method of limiting load capacity are

discussed with regard to welded connections. This method allows for calculation of operational weld capacity under conditions of static, complex loads. Based in part on tenets of plasticity theory, the method also has been useful in estimating the limiting load capacity of actual construction materials. Mathematical models of the limiting load capacity of transverse welds, oblique welds, and longitudinal welds illustrate the different capacities and characteristics of the major types of welds and couplings. Comparison of the limiting load capacity of welds with that of other coupled materials indicates similarities between the two. The statically permissible stress fields of welded material and material used for structural components is discussed. Author

N84-29242 Gesamthochschule, Essen (West Germany). Fachbereich Bauwesen.
WAVE PROPAGATION IN ELASTIC-VISCOPLASTIC BODIES [WELLENFORTPFLANZUNG IN ELASTISCH-VISKOPLASTISCHEN KOERPERN]
R. deBoer and D. Meyer Dec. 1983 89 p refs In GERMAN Presented at EUROMECH 175 on Viscosity and Appl., Bucharest, 6-10 Sep. 1983 Sponsored by Stiftung Volkswagenwerk
(Rept-23) Copyright. Avail: Issuing Activity

The propagation of waves in elastic-viscoplastic media was investigated. The waves are defined and classified. The conservation laws of continuum mechanics are derived, taking into account singularities. The entropy equation is also derived. The kinematics of deformations is treated. An elastic-viscoplastic materials law is presented, for which a so-called acoustic tensor is derived enabling the calculation of wave velocities by solving an eigenvalve problem. Author (ESA)

N84-29243 National Physical Lab., Teddington (England). Div. of Materials Applications.
CREEP DAMAGE MECHANICS AND MICROMECHANISMS
M. F. Ashby (Cambridge Univ.) and B. F. Dyson Mar. 1984 30 p refs
(NPL-DMA(A)77) Copyright. Avail: Issuing Activity

Micromechanisms of creep damage are classified, and a methodology of analysis is developed. For each mechanism, a damage-evolution law and a creep-law is derived. The result is a pair of differential equations, with the same form as that of the continuum treatment of Kachanov and Rabotnov. The equations can be integrated to give the shape of the creep curve, the time and strain to fracture, and residual life. Each mechanism exhibits a characteristic shape of creep curve, with an associated Monkman-Grant constant and creep ductility; these guide selection and use of the appropriate equations. Progress is made in unifying the continuum and micromechanistic approaches to creep fracture, and a method is presented for identifying the dominant damage mechanism (or class of mechanism) from the shape of the tensile creep curve. Author (ESA)

N84-29244*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Development Div.
SPARTAN RELEASE ENGAGEMENT MECHANISM (REM) STRESS AND FRACTURE ANALYSIS
Donna S. Marlowe and Erik J. West 19 Jun. 1984 9 p refs (Contract NAS8-35599)
(NASA-CR-173779; NAS 1.26:173779; LMSC-HREC-TR-D951498) Avail: NTIS HC A02/MF A01 CSCL 20K

The revised stress and fracture analysis of the Spartan REM hardware for current load conditions and mass properties is presented. The stress analysis was performed using a NASTRAN math model of the Spartan REM adapter, base, and payload. Appendix A contains the material properties, loads, and stress analysis of the hardware. The computer output and model description are in Appendix B. Factors of safety used in the stress analysis were 1.4 on tested items and 2.0 on all other items. Fracture analysis of the items considered fracture critical was accomplished using the MSFC Crack Growth Analysis code. Loads and stresses were obtaind from the stress analysis. The fracture analysis notes are located in Appendix A and the computer output in Appendix B. All items analyzed met design and fracture criteria. Author

N84-29245*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRUCTURES AND DYNAMICS DIVISION RESEARCH AND TECHNOLOGY PLANS FOR FY 1984 AND ACCOMPLISHMENTS FOR FY 1983
Kay S. Bales Jun. 1984 130 p
(NASA-TM-85828; NAS 1.15:85828) Avail: NTIS HC A07/MF A01 CSCL 20K

The Objectives, Expected Results, Approach, and Fiscal Year FY 1984 Milestones for the Structures and Dynamics Division's research programs are examined. The FY 1983 Accomplishments are presented where applicable. M.A.C.

N84-29246*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE ASTRO-1 PRELIMINARY DESIGN REVIEW COUPLED LOAD ANALYSIS
David S. McGhee Jun. 1984 881 p refs
(NASA-TM-82587; NAS 1.15:82587) Avail: NTIS HC A99/MF A01 CSCL 20K

Results of the ASTRO-1 preliminary design review coupled loads analysis are presented. The M6.0Y Generic Shuttle mathematical models were used. Internal accelerations, interface forces, relative displacements, and net e.g., accelerations were recovered for two ASTRO-1 payloads in a tandem configuration. Twenty-seven load cases were computed and summarized. Load exceedences were found and recommendations made. Author

N84-29247*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A COMPUTER PROGRAM FOR PREDICTING NONLINEAR UNIAXIAL MATERIAL RESPONSES USING VISCOPLASTIC MODELS
T. Y. Chang (Akron Univ., Ohio) and R. L. Thompson Jul. 1984 65 p refs
(NASA-TM-83675; E-2120; NAS 1.15:83675) Avail: NTIS HC A04/MF A01 CSCL 20K

A computer program was developed for predicting nonlinear uniaxial material responses using viscoplastic constitutive models. Four specific models, i.e., those due to Miller, Walker, Krieg-Swearengen-Rhode, and Robinson, are included. Any other unified model is easily implemented into the program in the form of subroutines. Analysis features include stress-strain cycling, creep response, stress relaxation, thermomechanical fatigue loop, or any combination of these responses. An outline is given on the theoretical background of uniaxial constitutive models, analysis procedure, and numerical integration methods for solving the nonlinear constitutive equations. In addition, a discussion on the computer program implementation is also given. Finally, seven numerical examples are included to demonstrate the versatility of the computer program developed. Author

N84-29248*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MODE 2 FATIGUE CRACK GROWTH SPECIMEN DEVELOPMENT
Robert J. Buzzard, Bernard Gross, and John E. Srawley [1983] 18 p refs Presented at the 17th Natl. Symp. on Fracture Mech., Albany, N.Y., 7-9 Aug. 1984; sponsored by Am. Soc. for Testing and Mater.
(NASA-TM-83722; E-2108; NAS 1.15:83722) Avail: NTIS HC A02/MF A01 CSCL 20K

A Mode II test specimen was developed which has potential application in understanding phenomena associated with mixed mode fatigue failures in high performance aircraft engine bearing races. The attributes of the specimen are: it contains one single ended notch, which simplifiers data gathering and reduction; the fatigue crack grous in-line with the direction of load application; a single axis test machine is sufficient to perform testing; and the Mode I component is vanishingly small. Autho

N84-29249*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THREE-DIMENSIONAL FINITE-ELEMENT ANALYSIS OF CHEVRON-NOTCHED FRACTURE SPECIMENS
I. S. Raju and J. C. Newman, Jr. Jul. 1984 34 p refs
(NASA-TM-85798; NAS 1.15:85798) Avail: NTIS HC A03/MF A01 CSCL 20K

Stress-intensity factors and load-line displacements were calculated for chevron-notched bar and rod fracture specimens using a three-dimensional finite-element analysis. Both specimens were subjected to simulated wedge loading (either uniform applied displacement or uniform applied load). The chevron-notch sides and crack front were assumed to be straight. Crack-length-to-specimen width ratios (a/w) ranged from 0.4 to 0.7. The width-to-thickness ratio (w/B) was 1.45 or 2. The bar specimens had a height-to-width ratio of 0.435 or 0.5. Finite-element models were composed of singularity elements around the crack front and 8-noded isoparametric elements elsewhere. The models had about 11,000 degrees of freedom. Stress-intensity factors were calculated by using a nodal-force method for distribution along the crack front and by using a compliance method for average values. The stress intensity factors and load-line displacements are presented and compared with experimental solutions from the literature. The stress intensity factors and load-line displacements were about 2.5 and 5 percent lower than the reported experimental values, respectively. Author

N84-29250*# National Aeronautics and Space Administration, Washington, D. C.
THE STATISTICAL THEORY OF THE FRACTURE OF FRAGILE BODIES. PART 2: THE INTEGRAL EQUATION METHOD
P. Kittl May 1984 10 p refs Transl. into ENGLISH from Boletin Sociedad Espanola de Ceramica y Vidrio (Chile), v. 21, no. 4/5, 1982 p 235-237 Transl. by Scientific Translations, Santa Barbara, Calif.
(Contract NAsw-3542)
(NASA-TM-77449; NAS 1.15:77449) Avail: NTIS HC A02/MF A01 CSCL 20K

It is demonstrated how with the aid of a bending test, the Weibull fracture risk function can be determined - without postulating its analytical form - by resolving an integral equation. The respective solutions for rectangular and circular section beams are given. In the first case the function is expressed as an algorithm and in the second, in the form of series. Taking into account that the cumulative fracture probability appearing in the solution to the integral equation must be continuous and monotonically increasing, any case of fabrication or selection of samples can be treated. Author

N84-29251*# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
THE EFFECT OF THICKNESS ON FATIGUE CRACK PROPAGATION IN 7475-T731 ALUMINUM ALLOY SHEET
R. A. Daiuto and B. M. Hillberry Jun. 1984 213 p refs
(Grant NAG1-231)
(NASA-CR-172367; NAS 1.26:172367) Avail: NTIS HC A10/MF A01 CSCL 20K

Tests were conducted on three thicknesses of 7475-T731 aluminum alloy sheet to investigate the effect of thickness on fatigue crack propagation under constant amplitude loading conditions and on retardation following a single peak overload. Constant amplitude loading tests were performed at stress ratios of 0.05 and 0.75 to obtain data for conditions with crack closure and without crack closure, respectively. At both stress ratios a thickness effect was clearly evident, with thicker specimens exhibiting higher growth rates in the transition from plane strain to plane stress region. The effect of thickness for a stress ratio of 0.05 corresponded well with the fracturing mode transitions observed on the specimens. A model based on the strain energy release rate which accounted for the fracture mode transition was found to correlate the thickness effects well. The specimens tested at the stress ratio of 0.75 did not make the transition from tensile mode to shear mode, indicating that another mechanism besides crack closure or fracture mode transition was active. Author

N84-29252*# Textron Bell Aerospace Co., Buffalo, N. Y. Structural Dynamics.
NASTRAN FORCED VIBRATION ANALYSIS OF ROTATING CYCLIC STRUCTURES Final Report
V. Elchuri, G. C. C. Smith, and A. Michael Gallo [1983] 31 p refs Presented at the ASME Conf. on Mech. Vibration and Noise, Dearborn, Mich., Sep. 1983
(Contract NAS3-22533)
(NASA-CR-173821; NAS 1.26:173821) Avail: NTIS HC A03/MF A01 CSCL 20K

Theoretical aspects of a new capability developed and implemented in NASTRAN level 17.7 to analyze forced vibration of a cyclic structure rotating about its axis of symmetry are presented. Fans, propellers, and bladed shrouded discs of turbomachines are some examples of such structures. The capability includes the effects of Coriolis and centripetal accelerations on the rotating structure which can be loaded with: (1) directly applied loads moving with the structure and (2) inertial loas due to the translational acceleration of the axis of rotation ("base' acceleration). Steady-state sinusoidal or general periodic loads are specified to represent: (1) the physical loads on various segments of the complete structure, or (2) the circumferential harmonic components of the loads in (1). The cyclic symmetry feature of the rotating structure is used in deriving and solving the equations of forced motion. Consequently, only one of the cyclic sectors is modelled and analyzed using finite elements, yielding substantial savings in the analysis cost. Results, however, are obtained for the entire structure. A tuned twelve bladed disc example is used to demonstrate the various features of the capability. M.G.

N84-29253# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
AEROELASTIC PROBLEMS CAUSED BY TORNADOS AND THEIR SUCCESSFUL TREATMENT WITH TECHNOLOGIES THAT RESULT FROM EXPERIENCES OF PRECEDENT INTENSIVE TECHNOLOGIC MODERNIZING [BEI DER ENTWICKLUNG DES TORNADOS AUFGETRETENE AEROELASTISCHE PROBLEME UND IHRE ERFOLGREICHE BEHANDLUNG DURCH TECHNOLOGIEN, DIE AUS DEN ERFAHRUNGEN VORANGEGANGENER TECHNOLOGIE-INTENSIVER RUESTUNGSPROGRAMME HERVORGINGEN]
J. Schoen 12 Apr. 1983 38 p refs In GERMAN
(MBB-FE294/S/PUB/110) Avail: NTIS HC A03/MF A01

The airframe structure of the Tornado aircraft is examined. The development of the airplane is described. The aeroelastic properties and the dynamic loads were observed during construction of the various swinging parts. Aeroelastic problems noted during the development of the aircraft are outlined. Transl. by E.A.K.

N84-29254# Tennessee Univ., Knoxville. Dept. of Civil Engineering.
A STUDY OF THERMAL PROPERTIES AND THE HEATING PROCESS IN ASPHALTIC CONCRETE Final Report, 1 Jul. 1982 - 31 Dec. 1983
W. H. Highter, R. J. Krane, and D. J. Wall Feb. 1984 158 p
(Grant AF-AFOSR-0250-82; AF Proj. 2307)
(AD-A141691; AFOSR-84-0432TR) Avail: NTIS HC A08/MF A01 CSCL 11/2

The objectives of this study were to model the surface heating of asphaltic concrete pavements and to investigate the thermal properties (conductivity, specific heat, and diffusivity) of asphaltic concrete. The thermal properties of six laboratory prepared asphaltic concrete mixes at three asphalt contents were determined. As a result of testing four or five replicate samples of each of the eighteen mix combinations, it was concluded that average values of specific heat and diffusivity, independent of asphalt content but dependent aggregate gradation and mineralogy, could be used. Conductivity varied with asphalt content as well as aggregate type and gradation. A parameter study using the transient

heat transfer model which employed radiant and convection heating of the pavement surface and conduction through the asphaltic concrete indicated that: without exceeding the flash point of asphaltic concrete, it typically takes a field heater 25-35 minutes to heat the pavement at a depth of 25 mm to a temperature sufficient for easy removal (this was verified by field test); combined convection-thermal radiation heating is more efficient than radiant heating, and; the best surface heating strategy is to operate the heater at a temperature such that the pavement reaches its maximum allowable temperature just as the desired temperature is reached at the prescribed removal depth without using insulation periods (soaking) between heat applications. GRA

N84-29255# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.
CONCRETE BEHAVIOR UNDER DYNAMIC TENSILE-COMPRESSIVE LOAD Final Report
P. F. Miaker, K. P. Vitaya-Udom, and R. A. Cole Jan. 1984 62 p
(AD-A141735; WES/TR/SL-84-1) Avail: NTIS HC A04/MF A01 CSCL 11/2

The significance of dynamic biaxial material behavior of concrete in the study of structural response to seismic and other dynamic loadings is noted. A testing procedure is developed to examine this behavior for the case of monotonic, tensile-compressive loadings. The results of experiments for load ratios between uniaxial compression and uniaxial tension in which the time of application spanned from 10 min to 25 msec are presented. The tensile stress at failure is seen to decrease with an increase of the simultaneously acting compressive stress. The strength is observed to increase as the loads act more quickly, but the strains at failure are invariant with respect to loading time. Author (GRA)

N84-29256# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Civil and Ocean Engineering.
APPLICATIONS OF THE SCANNING ELECTRON MICROSCOPE TO CONCRETE FAILURE (AXIAL, BIAXIAL, AND DYNAMIC) Final Report, 1 Sep. 1980 - 31 Aug. 1983
K. Derucher 5 Mar. 1984 101 p
(Grant AF-AFOSR-0256-80; AF Proj. 2307)
(AD-A141788; AFOSR-84-0431TR) Avail: NTIS HC A06/MF A01 CSCL 11/2

The major objective was to directly observe the formation and/or propagation of microcracks in concrete (plain and reinforced) both before and after applications of axial, biaxial, and dynamic stress fields. As part of this objective, procedures, techniques, apparatus, and equipment were developed and/or modified for the study of concrete fracture utilizing the Scanning Electron Microscope (SEM). In addition, information regarding microcracks, propagation of these microcracks (concrete failure), aggregate shape, plain and reinforced concrete, the sum effect of various stress fields, and the ultimate strength of concrete was found. Information regarding microcracks, aggregate shape, plain and reinforced concrete, the sum effects of various stress fields, and the ultimate strength of concrete was found for concrete containing blended cements. Concrete may fail from applied service loads or applied stress fields whether they are axial, biaxial, or dynamic. Also, concrete may fail as a result of volume changes such as the hydration of the cement paste leading to the shrinkage microcracks or to various cycles of wetting and drying or temperature variations (freezing and thawing). Thus, a model previously developed was investigated and the equations developed were found to be appropriate. GRA

N84-29257# Princeton Univ., N. J. Dept. of Civil Engineering.
ON CONTINUOUS DISTRIBUTIONS OF DISLOCATIONS IN NONLOCAL ELASTICITY
A. C. Eringen Apr. 1984 42 p
(Contract N00014-83-K-0126)
(AD-A141858; Rept-84-SM-1; TR-60) Avail: NTIS HC A03/MF A01 CSCL 20/11

A linear, nonlocal continuum theory of dislocations is developed. The field equations are given for the dislocation density and the stress fields due to continuous distributions of dislocations. Green's functions are obtained for two and three-dimensional media and an integral formula is given for line distribution of dislocations generalizing Peach-Koehler formula of the classical (local) theory. Unlike the classical theory, no stress singularities occur so that self-stress and energies of dislocation loops can be calculated involving no divergences. Exact solutions given for the line and circular distributions of dislocations verify these expectations.
Author (GRA)

N84-29258# Colorado Univ., Boulder. Dept. of Civil Environmental and Architectural Engineering.
IDENTIFICATION OF STRAIN-SOFTENING PROPERTIES AND COMPUTATIONAL PREDICTIONS OF LOCALIZED FRACTURE Annual Report, Aug. 1982 - Feb. 1984
K. J. Willam, S. Sture, N. Bicanic, J. Christensen, and B. Hurlbut 1 Mar. 1984 191 p
(Grant AF-AFOSR-0273-82; AF Proj. 2307)
(AD-A141866; AFOSR-84-0423TR) Avail: NTIS HC A09/MF A01 CSCL 11/2

The main objective of the present investigation is to evaluate strain-softening formulations for contained fracture in cementitious materials such as concrete and geo-materials. This report includes two principal developments: a rational approach to identify softening properties due to tensile cracking and frictional slip from displacement controlled material testing, and a systematic verification of contained fracture computations from small-scale structural testing. To this end, a composite damage model is proposed to describe the degradation of strength and stiffness in the post-peak regime with the aid of a volume fraction formulation of localized damage within a finite element. GRA

N84-29259# Naval Postgraduate School, Monterey, Calif.
ELASTIC-PLASTIC FRACTURE TOUGHNESS TESTING METHODS M.S. Thesis
W. K. Tritchler Dec. 1983 113 p
(AD-A142033) Avail: NTIS HC A06/MF A01 CSCL 20/11

An interactive computerized experimental procedure is presented for obtaining the elastic-plastic fracture toughness for a material. The process employs a bend type, single specimen approach by using the measured unloading crack opening displacement (COD) compliance to obtain the crack length. Data are taken, manipulated and plotted during the test to provide the operator with the necessary information to control the testing machine. The program automatically plots the J versus crack extension curve and determines Elastic-plastic fracture toughness upon completion of the test. A second program is presented to assist the operator in fatigue precracking the specimen. A third program is used to recall, list and plot the data that were stored on diskette during the test. GRA

N84-29260# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A THEORY OF RATE-DEPENDENT PLASTICITY Final Report
W. H. Drysdale May 1984 65 p
(DA Proj. 1L1-61102-AH-43)
(AD-A142102; AD-F300432; ARBRL-TR-02559) Avail: NTIS HC A04/MF A01 CSCL 20/11

The classical theory of rate-independent plasticity is modified by the addition of a rate variable to the yield surface. From considerations of physical metallurgy it is shown that the correct parameter to add is the effective plastic strain rate. Constitutive equations suitable for a rate-dependent elastic-plastic finite element structural analysis code are derived. For the simple loading case of uniaxial stress, an exact solution is derived which models many of the rate-dependent effects observed in material testing, e.g., the behavior of the stress-strain curves for constant rate tests change of rate tests, creep/relaxation above yield, etc. GRA

N84-29261# Dayton Univ., Ohio.
A REVIEW OF CRACK CLOSURE Interim Technical Report, Aug. - Dec. 1983
S. Banerjee Wright-Patterson AFB, Ohio AFWAL Apr. 1984 172 p Prepared in cooperation with Universal Energy Systems

(Contract F33615-81-C-5015)
(AD-A142273; AFWAL-TR-84-4031) Avail: NTIS HC A08/MF A01 CSCL 20/11

A comprehensive review and critique of the literature on fatigue crack closure is presented. The elements of closure; its mechanisms, experimental procedures for its determination; the phenomenological study of its dependence on different variables, and methodologies for its prediction, are all discussed in detail. Suggestions for future work and interpretations of findings of other authors are presented. Author (GRA)

N84-29262# George Washington Univ., Washington, D.C. School of Engineering and Applied Science.
DETERMINATION OF FAILURE CHARACTERISTICS OF MATERIALS AND STRUCTURES Final Technical Report, 1 Jun. 1975 - 30 Nov. 1983
H. Liebowitz 30 Nov. 1983 36 p
(Contract N00014-75-C-0946)
(AD-A142310) Avail: NTIS HC A03/MF A01 CSCL 20/11

A research program has been pursued with the objective of examining failure characteristics of materials and structures analytically and experimentally. The expression for the nonlinear energy toughness was rederived for a generalized instability condition and new expressions were derived for biaxial loading situations. The geometry dependence of the nonlinear energy toughness was studied experimentally using center-cracked thin sheet specimens and thicker compact tension specimens of several alloys and compared with other nonlinear toughness parameters. The nonlinear energy toughness can be used as a useful failure criterion under certain geometrical variations in semi brittle materials. Its geometry dependence is similar to that of Jlc. Experimental and finite element studies have shown that the plastic energy dissipation is a linear function of the plastic energy dissipation is a linear function of the stable crack growth, but the slope of the curve has been found to change considerably with changes in crack length-to-specimen width ratio. Singular solutions of cracked bodies predict no biaxial effect when one load axis is parallel to the crack plane. However, it has been shown analytically that including the second term reveals changes in stresses and strains in the vicinity of the crack tip due to biaxiality. Finite element studies show larger dependence of stresses and strains on biaxiality on ductile materials. Pulse duration has a significant effect on buckling under dynamic loading. Plastic deformation has a significant effect in buckling only when the imperfection is small, and creep plays an important role in long term loading. GRA

N84-29263# Sandia Labs., Albuquerque, N. Mex. Thermo-mechanical and Physical Div.
FRAGMENTATION UNDER IMPULSIVE STRESS LOADING
Dennis E. Grady 1984 10 p refs Presented at the SESA Spring Meeting, Cleveland, 15 May 1984
(Contract DE-AC04-76DP-00789)
(DE84-006341; SAND-82-1971C; CONF-840579-1) Avail: NTIS HC A02/MF A01

The fracture properties of brittle materials subjected to impulsive or high rate loading are considered. Fracture is viewed as a microstructural process through the activation, growth and coalescence of a system of interacting cracks. The loading rate dependence of fracture stress is explained in terms of inertia of isolated cracks. The number of cracks participating in the fracture process and the number and size of fragments in the failed material are related to both the inherent flaw structure and the rate of energy application required to sustain the system of growing cracks. Continuum modelling of dynamic fracture focused toward computational analyses of complex applied problems is covered. M.A.C.

N84-29264# Technische Hochschule, Darmstadt (West Germany). Fachgebiet Maschinenelemente und Getriebe.
STUDIES ON THE INSULATION EFFECT OF RUBBER SPRINGS IN COMPLEX STRUCTURES IN THE ACOUSTIC FREQUENCY RANGE Final Report, Nov. 1979
Wilfried Gerwig Bonn Bundesministerium fuer Forschung und Technologie Mar. 1984 195 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-84-001; ISSN-0171-7618) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 36

Acoustic insulation effects of rubber springs placed between machines and foundation structures were examined. Modulus of elasticity and damping factor of rubber springs were examined up to 1 kc/sec. A parameter study shows that construction modifications of the machine parts cause different effects within four frequency ranges. Results of a computation of structure-borne sound velocities of the machine foundation, based on measurements at a test foundation structure before installation of the machine, are given. Author (ESA)

N84-29265# Oxford Univ. (England). Dept. of Engineering Science.
FRACTURE INITIATION IN GLASS-REINFORCED PLASTICS UNDER IMPACT COMPRESSION
Y. Bai (Chinese Academy of Sciences, Peking) and J. Harding 1984 14 p refs Presented at Intern. Conf. on Struct. Impact and Crashworthiness, London, 16-20 Jul. 1984 Submitted for publication Sponsored by Air Force
(OUEL-1516/84) Avail: NTIS HC A02/MF A01

Stress-strain curves were obtained in compression at strain rates of 0.0001/sec and 500/sec for cylindrical specimens of unreinforced epoxy resin and for composite specimens containing a single layer, 3 layers and many layers of glass fiber mat in the same resin. In all cases the failure strength increases very markedly with strain rate. For the single layer and 3-layer specimens at both rates of loading the failure mode is by shear bands in the resin. Failure is initiated by shear fracture across the axially-aligned rovings at or near their node points followed by a decoupling of the reinforcing mat from the resin. For the multilayer specimens the failure mode is a combination of shear and longitudinal splitting, the latter predominating in the impact tests, and the distinction between initiation and propagation of failure becomes less clear. Author (ESA)

N84-29339*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE NASA WELDING ASSESSMENT PROGRAM
John Scott-Monck and John Bozek (NASA. Lewis Research Center) *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 220-222 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 13I

42 GEOSCIENCES (GENERAL)

N84-29266# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
YEARBOOK OF THE BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS, CANBERRA, 1 JULY 1982 - 30 JUNE 1983
G. M. Bladon, ed. 30 Jun. 1983 172 p refs
(BMR-83; ISSN-0158-7285) Avail: NTIS HC A08/MF A01

The research programs of the Australian Bureau of Mineral Resources were reviewed. Project topics include: (1) fossil fuels, (2) minerals, (3) groundwater, (4) earthquake hazards, (5) geoscience maps, (6) petroleum and minerals resource assessment, and (7) geoscience data bases. For individual titles, see N84-29267 through N84-29273.

N84-29267# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
FOSSIL FUELS **c44**
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983

p 21-42 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

The Fossil Fuels Program of the Australian Bureau of Mineral Resources investigates sedimentary basins, their history, and crustal framework, in order to develop an understanding of the processes controlling the genesis and distribution of fossil fuels and to provide a basis for their exploration and assessment. Research from the following subprograms of the Fossil Fuel program was reviewed: (1) the origin of fossil fuels in space and time, (2) onshore sedimentary basin analysis, (3) geophysical investigations of the structure of onshore basins, (4) offshore sedimentary basins, and (5) modern marine processes. R.S.F.

N84-29266# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
MINERALS c46
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983 p 42-66 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

The Minerals Program of the Australian Bureau of Mineral Resources aims to develop the understanding of the origin, abundance, age, and distribution of Australia's mineral resources in the context of the structure and geological history of the continent as a basis for exploration and assessment. Research from the following subprograms of the Minerals Program was reviewed: (1) the origin and distribution of minerals in space and time, (2) the metallogenic provinces of Australia, (3) remote sensing techniques applied to Australia's weathered zone and its related minerals, (4) airborne geophysical mapping, (5) crustal geophysics, and (6) the origin and distribution of offshore mineral deposits. R.S.F.

N84-29269# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
GROUNDWATER c43
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983 p 67-69 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

The Groundwater Program of the Australian Bureau of Mineral Resources seeks to establish the hydrodynamics and hydrochemistry of Australia's major groundwater resources as a basis for their assessment and development. Research in sedimentary basin and fractured-rock hydrogeology was reviewed. R.S.F.

N84-29270# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
EARTHQUAKE HAZARDS c46
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983 p 69-71 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

The Earthquake Hazards Program of the Australian Bureau of Mineral Resources seeks to assess earthquake risk throughout the Australian continent, to study the tectonic implications of earthquakes and crustal movements, and to monitor and interpret seismic waves from earthquakes and explosions. Research projects relating to seismology, earthquake risk assessment, geological faults, and crustal tectonics is presented. R.S.F.

N84-29271# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
NATIONAL AND INTERNATIONAL GEOSCIENCE MAPS c43
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983 p 71-74 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

The aims of the National and the International Geoscience Map Program of the Australian Bureau of Mineral Resources are to produce maps of the Australian continent and adjacent areas which summarize mineral resources and show the understanding of fundamental geology and geophysics. Several subprograms were reviewed which covered such topics as stratigraphy, geological folds, and tectonics. R.S.F.

N84-29272# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
OVERSEAS PROGRAMS c46
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983 p 75-83 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

Subprograms of the Overseas Program of the Australian Bureau of Mineral Resources are presented and discussed. Topics addressed in the subprograms include volcanology, the geology and geophysics of Southwest Pacific island arcs and structural basins, and antarctic paleomagnetism and geology. R.S.F.

N84-29273# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
PETROLEUM AND MINERALS RESOURCE ASSESSMENT c43
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983 p 83-90 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

The Petroleum and Minerals Resource Assessment Program of the Australian Bureau of Mineral Resources provides assessments of Australia's petroleum and mineral resources, determines the availability of these resources, and provides technical advice in relation to petroleum and mineral exploration and development. Several subprograms were reviewed including: petroleum resource assessment and availability and mineral resource assessment and availability. The National Geoscience Databases Program was also reviewed. R.S.F.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N84-29274# Academy of Sciences (USSR), Moscow.
GLACIOLOGY, VOLUME 3: THE MATHEMATICAL THEORY OF GLACIOMECHANICS
M. S. Krass 1983 146 p refs In RUSSIAN; ENGLISH summary (ISSN-0202-7283) Copyright. Avail: Issuing Activity

The mathematical modeling of glacial mechanics was discussed. Observations of glaciers, calculations of nonisothermal glacial mechanics and separate regions of ice sheets, calculations of the global evolution of glaciers, and the relationship of glacial dynamics to climatic alterations and tectonics were addressed. The theory of glacial thermodynamics and the problem of thermal stability also were examined. Mathematical and digital models are provided to illustrate various aspects of glacial mechanics. Calculations of the ice sheets on the planets of the solar system are appended. Author

N84-29275*# Earth Satellite Corp., Chevy Chase, Md.
EVALUATION OF LANDSAT-D THEMATIC MAPPER PERFORMANCE AS APPLIED TO HYDROCARBON EXPLORATION Final Report
J. Dykstra, J. Everett, R. Livaccarri, R. Michael, G. Richardson, S. Prucha, O. Russell, M. Ruth, C. Sheffield, and R. Staskowski Jun. 1984 249 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS5-27384)
(E84-10154; NASA-CR-173666; NAS 1.26:173666; Rept-1459)
Avail: NTIS HC A11/MF A01 CSCL 05B

Work with digital data of Oklahoma, Colorado, Wyoming, Utah and California demonstrate that the increased spectral refinement and spatial resolution of TM over MSS data greatly increase the value of the data to petroleum exploration in roles ranging from

logistic planning to direct detection of phenomena related to microseepage of hydrocarbons. The value of the spatial content versus the spectral content of the data increases as soil and vegetation cover increase. The structural detail visible in the imagery can contribute to exploration at the prospect level. Examination of the variance/covariance matrix suggests that a combination of bands 1, 4, and 5 displays the most information for most areas. M.A.C.

N84-29276*# Computer Sciences Corp., Silver Spring, Md.
LANDSAT-5 ORBIT ADJUST MANEUVER REPORT
Peter J. Hassett and Richard L. Johnson Jun. 1984 63 p refs ERTS
(Contract NAS5-27888)
(E84-10155; NASA-CR-175250; NAS 1.26:175250; CSC/TM-84/6075) Avail: NTIS HC A04/MF A01 CSCL 22A

The orbit adjust maneuvers performed to raise the LANDSAT 5 spacecraft to mission altitude, synchronize it with the required groundtrack, and properly phase the spacecraft with LANDSAT-4 to provide an 8 day full Earth coverage cycle are described. Maneuver planning and evaluation procedures, data and analysis results for all maneuvers performed to date, the frozen orbit concept, and the phasing requirement between LANDSAT-4 and LANDSAT-5 are also examined. M.A.C.

N84-29277*# California Univ., Santa Barbara. Dept. of Geography.
LANDSAT-D INVESTIGATIONS IN SNOW HYDROLOGY Quarterly Progress Report, 1 Apr. - 30 Jun. 1984
Jeff Dozier, Principal Investigator 30 Jun. 1984 6 p refs ERTS
(Contract NAS5-27463)
(E84-10156; NASA-CR-173668; NAS 1.26:173668) Avail: NTIS HC A02/MF A01 CSCL 08L

Two stream methods provide rapid approximate calculations of radiative transfer in scattering and absorbing media. Although they provide information on fluxes only, and not on intensities, their speed makes them attractive to more precise methods. The methods provide a comprehensive, unified review for a homogeneous layer, and solve the equations for reflectance and transmittance for a homogeneous layer over a non reflecting surface. Any of the basic kernels for a single layer can be extended to a vertically inhomogeneous medium over a surface whose reflectance properties vary with illumination angle, as long as the medium can be subdivided into homogeneous layers. M.A.C.

N84-29278*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYSIS OF NORMALIZED RADAR CROSS SECTION (SIGMA-O) SIGNATURE OF AMAZON RAIN FOREST USING SEASAT SCATTEROMETER DATA
Emedio M. Bracalente and Jon L. Sweet (Kentron International, Inc., Hampton, Va.) Aug. 1984 116 p refs ERTS
(E84-10168; NASA-TM-85779; L-15749; NAS 1.15:85779) Avail: NTIS HC A06/MF A01 CSCL 02F

The normalized radar cross section (NRCS) signature of the Amazon rain forest was SEASAT scatterometer data. Statistics of the measured (NRCS) values were determined from multiple orbit passes for three local time periods. Plots of mean normalized radar cross section, dB against incidence angle as a function of beam and polarization show that less than 0.3 dB relative bias exists between all beams over a range of incidence angle from 30 deg to 53 deg. The backscattered measurements analyzed show the Amazon rain forest to be relatively homogeneous, azimuthally isotropic and insensitive to polarization. The return from the rain forest target appears relatively consistent and stable, except for the small diurnal variation (0.75 dB) that occurs at sunrise. Because of the relative stability of the rain forest target and the scatterometer instrument, the response of versus incidence angle was able to detect errors in the estimated yaw altitude angle. Also, small instrument gain biases in some of the processing channels were detected. This led to the development of an improved NRCS algorithm, which uses a more accurate method for estimating the system noise power. Author

N84-29279# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS ON CARTOGRAPHY AND GEODESY. SERIES 2: TRANSLATIONS, NUMBER 40
1983 171 p refs
(ISSN-0469-4244) Avail: NTIS HC A08/MF A01

The satellite position program ORBDOP (extended GEODOP); satellite Doppler point positioning using the Navy Navigation Satellite System; Doppler point positioning at timekeeping laboratories in Europe; noise reduction and line following in multiscanned data; imaging quality and heighting accuracy of aerial cameras used at fairly high altitudes; and computer-assisted mapping and charting are discussed. For individual titles, see N84-29280 through N84-29285.

N84-29280# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE PROGRAM ORBDOP (EXTENDED GEODOP)
Hermann Hauck *In its* Repts. on Cartography and Geodesy. Ser. 2: Translations, No. 40 1983 p 5-21 refs (For primary document see N84-29279 19-43)
Avail: NTIS HC A08/MF A01

The semi short arc Doppler program GEODOP was extended to the short arc program ORBDOP for satellite position estimation. In ORBDOP no precise ephemerides are needed. The orbit is computed by the integration of the disturbing equation system using an approximative starting state vector at a defined epoch. The integration is based on Hill-variables. For orbit prediction two additional files are created: the orbit input file contains values of orbital parameters, the coefficient file contains the spherical harmonic coefficients of the disturbing Earth potential. Both files have card image form (80 characters). Author (ESA)

N84-29281# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
SATELLITE DOPPLER POINT POSITIONING USING THE NAVY NAVIGATION SATELLITE SYSTEM **c04**
Wolfgang Schlueter *In its* Repts. on Cartography and Geodesy. Ser. 2: Translations, No. 40 1983 p 23-97 refs Presented at Lecture Ser., Wuhan, China, Nov.-Dec. 1981 (For primary document see N84-29279 19-43)
Avail: NTIS HC A08/MF A01

The technique of Doppler point positioning using the U.S. Navy Navigation Satellite System is presented. The Navy Navigation Satellite System and geodetic receivers including the data output are described. Formulas for single point positioning and for (semi) short arc solutions are derived and refraction models are discussed. The data reduction concept using the program GEODOP is outlined. Author (ESA)

N84-29282# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
FINAL RESULTS OF DOPPLER POINT POSITIONING AT SEVERAL TIMEKEEPING LABORATORIES IN EUROPE **c04**
Wolfgang Schlueter and Ludwig Amberg *In its* Repts. on Cartography and Geodesy. Ser. 2: Translations, No. 40 1983 p 99-107 refs (For primary document see N84-29279 19-43)
Avail: NTIS HC A08/MF A01

At 21 stations in Europe point positioning was carried out using the Doppler technique. The observations of the satellites of the U.S. Navy Navigation Satellite System were performed in the period 6-16 November 1979. Coordinates computed with the precise ephemeris are given. Author (ESA)

N84-29283# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
NOISE REDUCTION AND LINE FOLLOWING IN MULTISCANNED DATA
Bernd-Siegfried Schulz *In its* Repts. on Cartography and Geodesy. Ser. 2: Translations, No. 40 1983 p 109-118 ref Presented at Intern. Symp. Helsinki, 7-11 Jun. 1982 (For primary document see N84-29279 19-43)
Avail: NTIS HC A08/MF A01

A method which reduces noise caused by the electro-optic scanning and by the object-dependent aerial inhomogeneity of the gray values during the preprocessing of digital recordings is presented. The logical connection of functions of the initial data reduces the two-dimensional incidental distribution of electronic noise; averaging of the gray values within threshold-dependent intervals existing between successive significant deficiencies reduces object noise. The digitized, filtered line or continuous tone originals are transformed into edge images, then vectorized by line following. A preprocessing step closes smaller gaps automatically and erases inadmissible line connections interactively. After the input of starting points, sections of uninterrupted lines are followed automatically; larger gaps are first interactively closed piecewise in a linear way by the input of targets and then followed. Vectorized lines are erased on the screen so that the state of work is always visible. Author (ESA)

N84-29284# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
CONTRIBUTIONS TO IMAGING QUALITY AND HEIGHTING ACCURACY OF AERIAL CAMERAS USED AT FAIRLY HIGH ALTITUDES
Joern Sievers and Karl Schuerer *In its* Repts. on Cartography and Geodesy. Ser. 2: Translations, No. 40 1983 p 119-139 refs Presented at ISPRS Commission I, Canbera, Australia, Apr. 1982 (For primary document see N84-29279 19-43)
Avail: NTIS HC A08/MF A01

The determination of image quality for imagery obtained in photo missions at flying heights of 6 to 14 km with 4 cameras of different focal length is considered. Resolving power determined with a tri-bar test target serves as quality criterion. The aerial film material AGFA Aviphot Pan 200 was used. A method to estimate heighting accuracy is derived. The influence of image quality in this model is discussed. Author (ESA)

N84-29285# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORT ON THE INTERNATIONAL CARTOGRAPHIC ASSOCIATION SEMINAR ON COMPUTER ASSISTED MAPPING AND CHARTING
Wigand Weber *In its* Repts. on Cartography and Geodesy. Ser. 2: Translations, No. 40 1983 p 141-167 Seminar held at Wuhan, China, 15 Oct.-1 Nov. 1981 (For primary document see N84-29279 19-43)
Avail: NTIS HC A08/MF A01

The organization, state of mapping activities and cartographic education in China, and the possibilities of automation were studied. Author (ESA)

N84-29286# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS ON CARTOGRAPHY AND GEODESY. SERIES 1: ORIGINAL REPORTS, NUMBER 91 [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN, REIHE 1: ORIGINALBEITRAEGE, HEFT NR. 91]
1983 100 p refs In GERMAN; ENGLISH and FRENCH summary Original contains large color map
(ISSN-0469-4236) Avail: NTIS HC A05/MF A01

A public water supply base map prepared on the basis of the German General Topographic Map 1 : 200,000 is cited. Relationships between ellipsoid parameters, a satellite Doppler positioning network, and design features of an Nd:YAP laser are considered. Automation-assisted revision conception of the General Topographic Map 1 : 200,000 using raster data and a data management system for digital raster maps are included. For individual titles, see N84-29287 through N84-29292.

N84-29287# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
PUBLIC WATER SUPPLY BASE MAP 1 : 200,000 [DIE ARBEITSKARTE OEFFENTLICHE WASSERVERSORGUNG 1 : 200,000]
Rolf Boehme *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 91 1983 p 5-9 refs In GERMAN; ENGLISH and FRENCH summary (For primary document see N84-29286 19-43)
Avail: NTIS HC A05/MF A01

A German public water supply base map is presented. It was prepared over a period of 10 years on the basis of the General Topographic Map 1 : 200,000. It comprises 42 sheets. Chronological order of map production, thematic representation and cartographic preparation form the various chapters. Author (ESA)

N84-29288# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
RELATIONSHIPS BETWEEN ELLIPSOID PARAMETERS [BEZIEHUNGEN ZWISCHEN DEN ELLIPSOIDPARAMETERN] **c64**
Dieter Ehlert *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 9 1983 p 11-23 refs In GERMAN; ENGLISH and FRENCH summary (For primary document see N84-29286 19-43)
Avail: NTIS HC A05/MF A01

The mathematical relationships between the commonly used ellipsoid parameters are represented by closed formulas and Taylor series. Author (ESA)

N84-29289# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DOPPLER OBSERVATION CAMPAIGN IN THE IVORY COAST: RECONNAISSANCE, MEASURING, INTERPRETATION AND EXPERIENCE Final Report [DIE DOPPLERMESSKAMPAGNE IN DER ELFENBEINKUESTE - ERKUNDUNG, MESSUNGSABLAUF, AUSWERTUNG UND ERFAHRUNGEN] **c04**
Walter Etling, Patrice Manti, Wolfgang Mueller, and Ewald Reinhart *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 91 1983 p 25-48 refs In GERMAN; ENGLISH and FRENCH summary (For primary document see N84-29286 19-43)
Avail: NTIS HC A05/MF A01

A satellite Doppler positioning network in the Republic of the Ivory Coast is described. The objectives were to set up a reference network for further surveying for planning and refinements of the infrastructure. The accuracy of the network, which includes 17 stations, is plus or minus 0.5 m. Author (ESA)

N84-29290# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DESIGN AND OPERATION MODE OF Nd:YAP LASERS IN MODULAR TRANSPORTABLE LASER RANGING SYSTEM (MTLRS) [AUFBAU UND FUNKTIONSWEISE DES Nd:YAP-LASERS IM MODULAREN TRANSPORTABLEN LASER-ENTFERNUNGSMESSYSTEM (MTLRS)] **c36**
Heinz Puell and Peter Wilson *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 91 1983 p 49-54 refs In GERMAN; ENGLISH and FRENCH summary (For primary document see N84-29286 19-43)
Avail: NTIS HC A05/MF A01

Design features and characteristics of the Nd:YAP laser are discussed. Operating capacities are wavelength 539 nm, stability 0.06 nm, band width 0.03 nm, output energy $>$ 10 mJ, pulse width 200 to 300 psec, impulse period 1, 2, 5, 10 Hz, weight 70 kg, and dimensions 120 x 30 x 30 cm. Simple construction and low weight are emphasized. Author (ESA)

N84-29291# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AUTOMATION-ASSOCIATED REVISION CONCEPTION OF THE GENERAL TOPOGRAPHIC MAP 1 : 200,000 USING RASTER DATA [KONZEPT ZUR AUTOMATIONSGESTUETZTEN FORTFUEHRUNG DER TOPOGRAPHISCHEN UEBERSICHTSKARTE 1 : 200,000 IM RASTERMODUS]
Wigand Weber *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 91 1983 p 55-75 ref In GERMAN; ENGLISH and FRENCH summary (For primary document see N84-29286 19-43)
Avail: NTIS HC A05/MF A01

An automated revision procedure of the German General Topographic Map 1 : 200,000 using raster data is presented. The

revision draft was prepared manually, then scanned and displayed with the old data by feature groups on a mulcitolor raster display unit. Symbolization of features to be added and erasure of the features to be eliminated were done via cross hairs. Clearings, enlargement of fillings, combination copying, and screening were carried out digitally. Besides automated symbol generation, the procedure offers additional advantages in that with digital copying no register mark problems nor scan line quality deteriorations in the course of several revisions occur. Author (ESA)

N84-29292# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
A DATA MANAGEMENT SYSTEM FOR DIGITAL RASTER MAPS [EIN DATENVERWALTUNGSSYSTEM FUER RASTERKARTEN] c61
Wigand Weber *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 91 1983 p 77-95 refs In GERMAN; ENGLISH and FRENCH summary (For primary document see N84-29286 19-43)
Avail: NTIS HC A05/MF A01

A high data rate management system for digital raster map processing is described. A PDP 11/34A host computer, an FPS array processor, a raster display, a raster plotter, and magnetic disks and tape were used. Functions include: transfer of digital raster data between components and between the configuration and the second raster data processing system; generation of rectangular windows, transformation of storage format, and conversion of gray values of raster map points; division of a large raster map into smaller subunits that can be kept by the core memory of the array processor and their presentation either in a systematic sequence or in an arbitrarily presented sequence; reservation of scratch areas for intermediate results of the user program; provision of default values for regularly recurring input values. Author (ESA)

N84-29293# Massachusetts Inst. of Tech., Cambridge.
ACTIVE AND PASSIVE REMOTE SENSING OF ICE Semiannual Report, 1 Aug. 1983 - 31 Jan. 1984
J. A. Kong Apr. 1984 53 p
(Contract N00014-83-K-0258)
(AD-A141473) Avail: NTIS HC A04/MF A01 CSCL 12/1

This is a report on progress that has been made in a study of active and passive remote sensing of ice. During this period the investigators (1) derived the backscattering coefficients for a two-layer anisotropic random medium; (2) calculated the emissivities from a two-layer anisotropic random medium; and (3) participated in the microwave sea ice measurement program at the Cold Regions Research and Engineering Laboratory. GRA

N84-29294# Naval Research Lab., Washington, D. C.
OVERVIEW OF ULTRAVIOLET REMOTE SENSING OF THE IONOSPHERE Interim Report
R. R. Meier 12 Apr. 1984 33 p
(RR03406)
(AD-A141533; AD-E000567; NRL-MR-5292) Avail: NTIS HC A03/MF A01 CSCL 17/5

Operational requirements in many area of the Department of Defense identify the need for ionospheric monitoring and forecasting. Properties of the ionosphere can be sensed remotely on a global scale, by observing naturally occurring ultraviolet emissions generated by photochemical and ionization processes. Especially in the F region. An overview of the field is presented in this report and the various issues are discussed in the context of recent observations of ionospherically related UV emissions. Day, night, and auroral phenomena are considered separately, due to fundamental differences in the physical and chemical processes involved. It is concluded that the concept of global ionospheric remote sensing shows substantial promise. The most pressing need is to expand the data base to cover the full range of geographic, local time, and solar and geomagnetic conditions. GRA

N84-29295# Hydrologic Engineering Center, Davis, Calif.
INFILTRATION AND SOIL MOISTURE REDISTRIBUTION IN HEC-1
A. D. Feldman and D. M. Goldman Jan. 1984 20 p Presented at the Fall Meeting of the American Geophysical Union, San Francisco, 9 Dec. 1983
(AD-A141626; HEC-TP-95) Avail: NTIS HC A02/MF A01 CSCL 08/8

The major factors which determine the shape and size of a hydrograph are presented to set the stage of the infiltration process. The HEC-1 methodology for representing that infiltration process is described. Modelers are cautioned not to over emphasize one aspect of the runoff process at the expense of the components before and after it. Finally, the spatial and temporal definition of the runoff process by the models was discussed. GRA

N84-29296# Environmental Research Inst. of Michigan, Ann Arbor. Radar Div.
THE USE OF SATELLITE AND AIRCRAFT SAR TO DETECT AND CHART HAZARDS TO NAVIGATION Final Report, Aug. 1982 - Aug. 1983
E. S. Kasischke, R. A. Shuchman, J. D. Lyden, G. A. Meadows, and D. R. Lyzenga Aug. 1983 331 p
(Contracts N00014-82-C-2308; N00014-76-C-1048)
(AD-A141658; ERIM-163000-2-F) Avail: NTIS HC A15/MF A01 CSCL 08/3

A total survey of SEASAT and SIR-A L-band Synthetic Aperture Radar (SAR) imagery for the presence of bottom-related surface patterns was completed. Aircraft X-band SAR data collected by an APD-10 system was also reviewed. Examples from these three SAR systems are presented which further illustrate the types of bottom-related surface patterns which appear on SAR imagery. A comparison of digital SAR image intensities versus depth data demonstrates the correlation of the SAR surface patterns to bottom features, and when combined with ancillary environmental data, demonstrates the dependence of SAR surface patterns on the ambient environmental conditions. First order hydrodynamic/electromagnetic models are presented which demonstrate how bottom-related surface patterns appear on SAR images. GRA

N84-29297# Army Engineer Topographic Labs., Wright-Patterson AFB, Ohio.
REGISTRATION OF A LANDSAT IMAGE TO DTM (DIGITAL TERRAIN MATRIX): AN ERROR ANALYSIS
M. A. Crombie, J. A. Shine, W. Moore, and G. Allton Jan. 1984 53 p
(DA Proj. 4A7-62707-A-855)
(AD-A141766; ETL-0350) Avail: NTIS HC A04/MF A01 CSCL 12/1

A mathematical model is postulated and tested that will enable a user to relate a digital LANDSAT image to a digtial terrain matrix (DTM). The practicality of the procedure is examined and evaluated. One reason for registering a LANDSAT digital image to a DTM is to add another dimension to the signature used in scene classification. Ground elevation associated with a pixel can be converted to a terrain slope that, along with orientation with respect to the Sun, can be used as an additional component in a pattern recognition exercise. Pixel heights can also be used to restrict the pattern recognition scheme to test over the most likely subset of classes when scene classes can be organized by terrain heights a priori. The purpose of this report is to evaluate the accuracy with which the elevation assignments can be made when the registration process described herein is used. GRA

N84-29298# Army Engineer Topographic Labs., Fort Belvoir, Va.
BIBLIOGRAPHY OF IN-HOUSE AND CONTRACT REPORTS, SUPPLEMENT 12 Report Bibliography 1 Jan. - 31 Dec. 1983
R. P. Barron Mar. 1984 114 p Supplement to ETL-SR-70-1
(AD-A141778; ETL-0353-Suppl-12) Avail: NTIS HC A06/MF A01 CSCL 08/2

This is Supplement 12 to the report titled 'Bibliography of

In-House and Contract Reports' (AD-877 653L), (Supplement 1, AD-890 066L), (Supplement 2, AD-905 548L), (Supplement 3, AD-B005 275L), (Supplement 4, AD-B010 642L), (Supplement 5, AD-B019 966L), (Supplement 6, AD-A055 468), (Supplement 7, AD-A068 744), (Supplement 8, AD-A084 111), (Supplement 9, AD-A099 803), (Supplement 10, AD-A113 006), (Supplement 11, AD-A126 400). It is a continuing bibliography of reports prepared by and for the U.S. Army Engineer Topographic Laboratories (USAETL), Fort Belvoir, VA. This bibliography includes reports that were published from 1 January 1983 through 31 December 1983. GRA

N84-29299# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
PRELIMINARY GUIDE TO THE ONSITE IDENTIFICATION AND DELINEATION OF THE WETLANDS OF ALASKA Final Report
R. T. Huffman and G. E. Tucker Feb. 1984 116 p
(AD-A142091; WES/TR/Y-78-9) Avail: NTIS HC A06/MF A01 CSCL 08/6

This guide to the major wetland plant associations and communities found in Alaska is one of a series of eight such guides, each prepared by a specialist or specialists familiar with the wetlands in the region covered by the guide. The guides are intended for distribution to the various U.S. Army Engineer Districts for use in the onsite technical identification and delineation of wetland boundaries. The classification system in this guide is adapted from that utilized by the National Wetlands Inventory (NWI) Project of the U.S. Fish and Wildlife Service, but frequently departs from NWI's system to describe common and/or distinct wetland communities or associations. GRA

N84-29300# Maryland Univ., College Park. Center for Automation Research.
PARALLEL IMAGE PROCESSING AND IMAGE UNDERSTANDING Interim Report, 1 Apr. 1983 - 31 Mar. 1984
A. Rosenfeld Apr. 1984 7 p
(Contract F49620-83-C-0082)
(AD-A142162; AFOSR-84-0457TR) Avail: NTIS HC A02/MF A01 CSCL 14/5

During this period, the eight investigators produced 10 papers with titles including Reliability in cellular arrays through data sharing, Interactive software systems for computer vision, On mapping homogeneous graphs on a linear array processor model, A parallel method for natural texture synthesis, and Embedding of networks of processors into hypercubes. Author (GRA)

N84-29301# Florida Univ., Gainesville. Dept. of Mathematics.
THE DEVELOPMENT OF A MATHEMATICAL FOUNDATION FOR CELLULAR IMAGE PROCESSING Final Report, 1 Mar. 1983 - 29 Feb. 1984
G. X. Ritter Feb. 1984 22 p
(Grant AF-AFOSR-0065-83)
(AD-A142173; AFOSR-84-0472TR) Avail: NTIS HC A02/MF A01 CSCL 14/5

The primary result of this research effort has been the development of an image algebra that can serve as the foundation of a common algebraically based image processing language. In comparison to other existing image algebras, this algebra is capable of expressing common image processing algorithms and transforms in terms of its operators. Author (GRA)

N84-29302# Maryland Univ., College Park. Center for Automation Research.
EVIDENCE ACCUMULATION FOR SPATIAL REASONING
T. Matsuyama, V. S. S. Hwang, and L. S. Davis Mar. 1984 60 p
(Contract F49620-83-C-0082)
(AD-A142174; CAR-TR-54; CS-TR-1381; AFOSR-84-0468TR)
Avail: NTIS HC A04/MF A01 CSCL 14/5

In a previous report the authors described the organization of an aerial image analysis system. There are three levels of representation and control in that system: A High Level Expert (HLE) that utilizes a symbolic hierarchical model for the possible spatial organization of objects in the image to build partial, local interpretations of the image and to determine where to further analyze the image and what analyses to perform; a Model Selection Expert that determines, on the basis of contextual information provided by the HLE, the most promising appearance descriptions to use in searching for objects and structures in the image; and a Low Level Vision Expert that finds pictorial entities that satisfy these appearance descriptions by selecting image processing methods to find the appropriate entities. Emphasis has been on the High Level Expert, which is based on a general method of "evidence accumulation' to perform flexible spatial reasoning. This paper contains a detailed description of the evidence accumulation process and its associated consistency checking process. GRA

N84-29303# Susquehanna Resources and Environment, Inc., Johnson City, N.Y.
APPLICATIONS OF TEXTURE ANALYSIS FOR ROCK TYPES DISCRIMINATION, PHASE 2 Final Report, Nov. 1982 - Nov. 1983
S. Hsu Dec. 1983 64 p
(Contract F49620-83-C-0029; ARPA Order 4288)
(AD-A142268; AFOSR-84-0477TR) Avail: NTIS HC A04/MF A01 CSCL 14/5

Aimed at developing image processing methods for rock types analysis with LANDSAT data, numerous experiments were conducted using supervised and unsupervised classification techniques under the general concept of texture analysis with LANDSAT digital data covering two geological quads of Nevada. The results indicate that the supervised classification method is very effective in the extraction of granite regions when (1) data were in ratio format, (2) feature variables included both tone and texture information, and (3) the classifier is capable of handling non-normally distributed data. Classification errors occurred when there exists pixels of non-granite category whose spectral and textural properties are statistically similar to that of granite pixels. Two cases of errors can be noted: Type 1 pixels located at the periphery of the granite regions, and Type 2 pixels located far away from the core of the granite areas. GRA

N84-29304# Research Inst. of National Defence, Stockholm (Sweden).
COMPUTER-AIDED MAPPING IN THE USA: EXPERIENCES FROM A STUDY TOUR IN NOVEMBER 1983
Erland Jungert, Ted Popoff, and Anders Wellving Mar. 1984 40 p refs In SWEDISH; ENGLISH summary
(FOA-C-20533-D8; ISSN-0347-3694) Avail: NTIS HC A03/MF A01

Digital mapping techniques; mapping data bases; orophotography; map scanning; scanner-plotter systems; image processing; topography; hydrography; chart printing; data storage; photogrammetry; interactive graphic systems; digital terrain models; image processing languages and cooperation possibilities; and a computer vision laboratory for geographic information systems are discussed. Author (ESA)

N84-29305# Research Inst. of National Defence, Linkoeping (Sweden).
PROCEEDINGS OF THE CONFERENCE ON MICROWAVE SIGNATURES IN REMOTE SENSING
Jan Askne, Hans Hellsten, and Bengt Svensson Mar. 1984 41 p In SWEDISH; ENGLISH summary Proc. held at Toulouse, 16-20 Jan. 1984
(FOA-C-30359-E1,E3; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR 50

Developments in the applications of microwaves to remote sensing were reported. Polarization effects in sea ice signatures; microwave scattering from sea water waves; stepped frequency microwave radiometer measurements in hurricanes; backscattering properties of high mountain areas; the prediction of root soil moisture with a water balance microwave model; microwave features of vegetation, measures of the sources of scatter from vegetation; theoretical scattering models; and determination of

dielectric properties of different materials are discussed.
Author (ESA)

N84-29306# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS ON CARTOGRAPHY AND GEODESY. SERIES 2: TRANSLATIONS, NUMBER 41. REPORT ON HIGH PRECISION GRAVIMETRY, VOLUME 2
Erwin Groten, ed., M. Becker, H. Dragert, E. Kanngieser, A. Lambert, J. Maekinen, B. Richter, and D. Woodward 1983 103 p refs Sponsored by International Association of Geodesy (ISSN-0469-4244) Avail: NTIS HC A06/MF A01

Construction and calibration of a gravimeter; tidal corrections; environmental effects on precise gravity measurements; statistical adjustment and design of high precision measurements; and applications of high precision gravimetry are discussed.
Author (ESA)

N84-28831# Joint Publications Research Service, Arlington, Va.
DOCKING OF 'PROGRESS-19', MAPPING AND SURVEY WORK
A. Ivakhnov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 23-25 Transl. into ENGLISH from Izvestiya (USSR), 25 Feb. 1984 p 4 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28867# Joint Publications Research Service, Arlington, Va.
RESULTS FROM STUDY OF EARTH RESOURCES FROM SPACE
L. Zlobin and Y. Kelner *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 98-100 Transl. into ENGLISH from Pravda (USSR), 12 Sep. 1983 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28870# Joint Publications Research Service, Arlington, Va.
SENSING OF FACTORS INVOLVED IN DEVELOPMENT OF EXOGENOUS PROCESSES ON SPACE PHOTOGRAPHS OF ARID TERRITORIES Abstract Only
A. I. Svitnev, M. I. Burleshin, and I. D. Kolesnikov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 103 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 40-48 Original language document announced as A84-14844 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28871# Joint Publications Research Service, Arlington, Va.
STRUCTURAL-GEOMORPHOLOGICAL INTERPRETATION OF LINEAMENTS DETECTED FROM SPACE PHOTOGRAPHS AND PATTERNS OF MINERAL DISTRIBUTION Abstract Only
A. Y. Fedorov and Y. K. Yelistratova *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 103-104 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 49-59 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28872# Joint Publications Research Service, Arlington, Va.
SEASONAL VARIATION OF SPECTRAL BRIGHTNESS COEFFICIENTS FOR BARLEY AND RYE Abstract Only
T. A. Nilson, Y. A. Anton, and V. B. Apley *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 104-105 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 72-80 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28873# Joint Publications Research Service, Arlington, Va.
ORGANIZING WORK WITH INFORMATION FLOWS IN SYSTEM FOR AUTOMATED PROCESSING OF DATA FROM REMOTE SENSING OF THE EARTH FOR USE IN AGRICULTURE Abstract Only
Y. S. Kolesnikov, G. S. Popov, and Y. V. Skorobogatov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 105-106 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 85-92 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28874# Joint Publications Research Service, Arlington, Va.
AUTOMATED SEARCH FOR CONTROL IMAGES ON PHOTOGRAPHS OF EARTH'S SURFACE USING SPECTRAL ANALYSIS Abstract Only
D. K. Tkhabisimov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 106 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 93-99 Original language document announced as 84A-14848 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28876# Joint Publications Research Service, Arlington, Va.
CRITERIA FOR EFFICIENCY OF EXPERIMENTS IN REMOTE SENSING Abstract Only
A. A. Yakovlev *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 107-108 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 103-112 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-29269# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
GROUNDWATER
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983 p 67-69 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

N84-29271# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
NATIONAL AND INTERNATIONAL GEOSCIENCE MAPS
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983 p 71-74 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

N84-29273# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
PETROLEUM AND MINERALS RESOURCE ASSESSMENT
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983 p 83-90 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N84-29307*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SPACE PHOTOVOLTAIC RESEARCH AND TECHNOLOGY 1983. HIGH EFFICIENCY, RADIATION DAMAGE, AND BLANKET TECHNOLOGY
Washington, D.C. 1984 266 p refs Conf. held in Cleveland, 18-20 Oct. 1983
(NASA-CP-2314; E-2005; NAS 1.55:2314) Avail: NTIS HC A12/MF A01 CSCL 10A

This three day conference, sixth in a series that began in 1974, was held at the NASA Lewis Research Center on October

16-20, 1983. The conference provided a forum for the discussion of space photovoltaic systems, their research status, and program goals. Papers were presented and workshops were held in a variety of technology areas, including basic cell research, advanced blanket technology, and radiation damage. For individual titles, see N84-29308 through N84-29346.

N84-29308*# National Aeronautics and Space Administration, Washington, D. C.
NASA-OAST PHOTOVOLTAIC ENERGY CONVERSION PROGRAM
Jerome P. Mullin and John C. Loria *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 1-7 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

The NASA program in photovoltaic energy conversion research is discussed. Solar cells, solar arrays, gallium arsenides, space station and spacecraft power supplies, and state of the art devices are discussed. R.J.F.

N84-29309*# Communications Satellite Corp., Clarksburg, Md.
STRUCTURALLY STABLE, THIN SILICON SOLAR CELLS
R. A. Arndt and A. Meulenberg *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 8-11 refs (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

A fabrication process for structurally stable thin solar cell wafers that produce good power output after irradiation is described. The fabrication process is as follows. A 6 mil, circular wafer is oxidized on both sides. One side is then patterned with a rectangular array of holes in the oxide that are nominally 75 mils square and separated by 2 mil spacings. Wells are then etched into the silicon with KOH to a depth of 4 mils, leaving a 2 mil, unetched thickness. Two areas on the surface are left unetched to provide pads for bonding or testing. All oxide is then removed and the rest of the processing is normal; the unetched face is used as the illuminated face. When all other processing is complete, a 2 X 2 cm cell is sawed from the starting wafer leaving a border that is approximately 10 mils wide. The effective thickness, determined by weighing an unmetallized sample, of such a cell is about 2.4 mil. R.J.F.

N84-29310*# Hughes Research Labs., Malibu, Calif.
RECENT ADVANCES IN LPE GaAs-BASED SOLAR CELLS
G. S. Kamath, R. Y. Loo, and R. C. Knechtli *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 12-17 refs (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Several modifications were made to an infinite solution liquid phase epitaxy system that help fabricate both GaAs-based cells and thin cells that effectively reduce power-to-weight ratio for space applications. The most important development is the multiwell crucible for multilayer growth. Using a split crucible in one system, as many as five layers were grown in succession with varying Al levels and dopants. The structures grown were used to produce thin GaAs cells only 10 to 20 microns thick and also to grow cascade cell components. Results of these studies are presented and their applications to the future development of GaAs-based cells are discussed. R.J.F.

N84-29311*# Applied Solar Energy Corp., City of Industry, Calif.
PROCESS IN MANUFACTURING HIGH EFFICIENCY AlGaAs/GaAs SOLAR CELLS BY MO-CVD
Y. C. M. Yeh, K. I. Chang, and J. Tandon *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 18-24 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Manufacturing technology for mass producing high efficiency GaAs solar cells is discussed. A progress using a high throughput MO-CVD reactor to produce high efficiency GaAs solar cells is discussed. Thickness and doping concentration uniformity of metal oxide chemical vapor deposition (MO-CVD) GaAs and AlGaAs layer growth are discussed. In addition, new tooling designs are given which increase the throughput of solar cell processing. To date, 2cm x 2cm AlGaAs/GaAs solar cells with efficiency up to 16.5% were produced. In order to meet throughput goals for mass producing GaAs solar cells, a large MO-CVD system (Cambridge Instrument Model MR-200) with a susceptor which was initially capable of processing 20 wafers (up to 75 mm diameter) during a single growth run was installed. In the MR-200, the sequencing of the gases and the heating power are controlled by a microprocessor-based programmable control console. Hence, operator errors can be reduced, leading to a more reproducible production sequence. R.J.F.

N84-29312*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OPTIMAL DESIGN OF GaAs-BASED CONCENTRATOR SPACE SOLAR CELLS FOR 100 AMO, 80 DEG C OPERATION
Chandra Goradia (Cleveland State Univ.), Manju Ghalla-Goradia (Cleveland State Univ.), and Henry Curtis *In its* Space Photovoltaic Res. and Technol. 1983 1984 p 25-33 (For primary document see N84-29307 19-44)
(Grant NAG3-249)
Avail: NTIS HC A12/MF A01 CSCL 10A

Using a detailed computer code and reasonable values of electrical and optical material parameters from current published literature, parameter optimization studies were performed on three configurations of GaAs-based concentrator solar cells for 100 AMO, 80 C operation. These studies show the possibility of designing GaAs-based solar cells with efficiencies exceeding 22% at 100 AMO 80 C and probable efficiency degradation of less than 15% after a 70% reduction in diffusion length in each cell region. Author

N84-29313*# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
TWO-DIMENSIONAL COMPUTER SIMULATION OF EMVJ AND GRATING SOLAR CELLS UNDER AMO ILLUMINATION
J. L. Gray and R. J. Schwartz *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 34-40 ref (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

A computer program, SCAP2D (Solar Cell Analysis Program in 2-Dimensions), is used to evaluate the Etched Multiple Vertical Junction (EMVJ) and grating solar cells. The aim is to demonstrate how SCAP2D can be used to evaluate cell designs. The cell designs studied are by no means optimal designs. The SCAP2D program solves the three coupled, nonlinear partial differential equations, Poisson's Equation and the hole and electron continuity equations, simultaneously in two-dimensions using finite differences to discretize the equations and Newton's Method to linearize them. The variables solved for are the electrostatic potential and the hole and electron concentrations. Each linear system of equations is solved directly by Gaussian Elimination. Convergence of the Newton Iteration is assumed when the largest correction to the electrostatic potential or hole or electron quasi-potential is less than some predetermined error. A typical problem involves 2000 nodes with a Jacobi matrix of order 6000 and a bandwidth of 243. R.J.F.

N84-29314*# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
RADIATION TESTING OF GaAs ON CRRES AND LIPS EXPERIMENT
Terry M. Trumble and Kenneth Masloski *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 41-48 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

The radiation damage of solar cells has become a prime concern to the U.S. Air Force due to longer satellite lifetime requirements. Flight experiments were undertaken on the Navy Living Plume Shield (LPS) satellite and the NASA/Air Force Combined Release and Radiation Effects Satellite (CRRES) to complement existing radiation testing. Each experiment, the rationale behind it, and its approach and status are presented.

The effect of space radiation on gallium arsenide (GaAs) solar cells was the central parameter investigated. Specifications of the GaAs solar cells are given. R.S.F.

N84-29315*# TRW Space Technology Labs., Redondo Beach, Calif.
SOLAR CELL DEGRADATION IN PROTON RADIATION ORBITS
H. S. Rauschenbach and J. Y. Yaung *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 49-55 refs (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Significant discrepancies have been observed between predicted and actual in-orbit silicon solar array degradation in orbits other than LEO (low Earth orbits) and GEO (geosynchronous orbit). These discrepancies have been diagnosed to arise probably from a combination of a lack of appropriate solar cell test data and from inadequacies in the models that relate the unidirectional and mono-energetic proton test data to the omnidirectional flux-energy spectra actually found in orbit. Relative damage coefficients and solar cell power outputs were discussed, and also were presented in graph form. Silicon and gallium arsenide solar cells were considered. R.S.F.

N84-29316*# TRW Defense Systems Group, Redondo Beach, Calif.
MODEL OF SOLAR CELL PROTON DAMAGE
J. Y. Yaung *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 56-62 refs (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

A short circuit current (I sub sc) degradation model for gallium arsenide (GaAs) solar cells irradiated by protons from low energy to 100 MeV was developed. This model was found to be satisfactory in predicting the I sub sc degradation of GaAs cells, but not that of silicon (Si) cells. A modification to the aforementioned model that preserves the optical wavelength dependency in the photogeneration of minority carrier pairs was described herein. Spectral Si and GaAs response and I sub sc for the Si and GaAs solar cells were discussed, and also were presented in graph form. The overall predictability of the modified model was deemed to be satisfactory. R.S.F.

N84-29317*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
PIECEWISE SIMULATION PROTON TEST OF GALLIUM ARSENIDE AND THIN SILICON SOLAR CELLS
D. G. Peterson and S. A. Billets *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 63-73 refs (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Gallium Arsenide (GaAs) solar cells are viewed as a potential primary power source on certain future Earth orbiting satellites. However, the relative merits of gallium arsenide over silicon in a space radiation environment are largely unknown because a general degradation model for gallium arsenide does not exist. The results of a test simulating the proton radiation environment existing in a polar orbit and the concomitant effects on GaAs and thin silicon (Si) solar cells are presented. The objectives and methodology of the simulation test were discussed. The electrical characteristics of GaAs and Si solar cells are given in graph form. It was concluded that GaAs cells are viable for use on satellites in low Earth orbit. R.S.F.

N84-29318*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RADIATION TOLERANCE OF LOW RESISTIVITY, HIGH VOLTAGE SILICON SOLAR CELLS
V. G. Weizer, I. Weinberg, and C. K. Swartz *In its* Space Photovoltaic Res. and Technol. 1983 1984 p 74-80 refs (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

The radiation tolerance of the following three low resistivity, high voltage silicon solar cells was investigated: (1) the COMSAT MSD (multi-step diffused) cell, (2) the MinMIS cell, and (3) the MIND cell. A description of these solar cells is given along with drawings of their configurations. The diffusion length damage coefficients for the cells were calculated and presented. Solar cell spectral response was also discussed. Cells of the MinMIS type were judged to be unsuitable for use in the space radiation environment. R.S.F.

N84-29319*# Aerospace Corp., El Segundo, Calif.
ON-ORBIT PERFORMANCE OF LIPS GALLIUM ARSENIDE SOLAR CELL EXPERIMENT
T. Bavaro, R. Francis, and M. Pennell *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 81-89 refs (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Telemetry from the Living Plume Shield's gallium arsenide solar panel experiment was evaluated to determine degradation. The data were culled to preclude spurious results from possible shadowing or inaccurate measurements on a cold array. Two independent methods were then used to obtain the maximum power points and the various characteristics of the solar array. Fill factor, open circuit voltage, short circuit current, and series and shunt resistances were examined. The data analysis concluded that, to date, nearly all of the solar array degradation is due to the reduction in the short circuit current. Author

N84-29320*# Rome Air Development Center, Hanscom AFB, Mass.
INFLUENCE OF OXYGEN ON DEFECT PRODUCTION IN ELECTRON-IRRADIATED, BORON-DOPED SILICON Abstract Only
Henry M. DeAngelis and Peter J. Drevinsky *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 90 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Deep level transient spectroscopy (DLTS) measurements were made on float-zone and crucible-grown, boron-doped silicon irradiated with 1-MeV electrons. The minority carrier trap attributed to a boron-related state, was not seen in low-resistivity, float-zone silicon. However, a new majority carrier trap was observed in these samples. In the case of more lightly doped material the minority carrier trap was present, and its introduction rate was lower in float-zone than in crucible-grown silicon. For 1- and 10-ohm-cm float-zone material that was oxidized during processing, the introduction rates for this trap were comparable to those for crucible-grown silicon. This behavior indicates that the minority carrier trap involves oxygen and that it may be due to a boron-oxygen complex. The majority carrier trap seen in heavily doped, float-zone silicon may also involve boron but not oxygen. Observed trap concentrations suggest that oxygen content in the regions examined by DLTS is affected by processing techniques. Other differences were observed in defect production and annealing behavior of electron-irradiated, float-zone and crucible-grown silicon. Author

N84-29321*# Florida Univ., Gainesville.
DEFECT STUDIES IN ONE MeV ELECTRON IRRADIATED GaAs AND IN Al/SUB X Ga/SUB L-X As P-N JUNCTION SOLAR CELLS
Sheng S. Li, W. L. Wang, R. Y. Loo (Hughes Research Lab.), and W. P. Rahilly (Aeropropulsion Lab.) *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 91-101 refs Sponsored in part by AFWAL and AFOSR (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Deep level transient spectroscopy reveals that the main electron traps for one-MeV electron irradiated GaAs cells are E9c)-0.31, E(c)-0.90 eV, and the main hole trap is due to the level. Electron trap density was found to vary irom 3/tens-trillion ccm for 2/one quadrillion cm 3/3.7 quadrillion cm for 21 sextillion cm electron fluence for electron fluence; a similar result was also obtained for the hole trap density. As for the grown-in defects in the Al(x)Ga(1-x)As p-n junciton cells, only two electron traps with energies of E(c)-0.20 and E(c)-0.34 eV were observed in samples

with x = 0.17, and none was found for x < 0.05. Auger analysis on the Al(x)Ga(1-x) As window layer of the GaAs solar cell showed a large amount of oxygen and carbon contaminants near the surface of the AlGaAs epilayer. Thermal annealing experiment performed at 250 C for up to 100 min. showed a reduction in the density of both electron traps. A.R.H.

N84-29322*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CELL AND DEFECT BEHAVIOR IN LITHIUM-COUNTERDOPED SOLAR CELLS
I. Weinberg, S. Mehta (Cleveland State Univ.), and C. K. Swartz *In its* Space Photovoltaic Res. and Technol. 1983 1984 p 102-110 refs (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Some n(+)/p cells in which lithium is introduced as a counterdopant, by ion-implantation, into the cell's boron-doped p-region were studied. To determine if the cells radiation resistance could be significantly improved by lithium counterdoping. Defect behavior was related to cell performance using deep level transient spectroscopy. Results indicate a significantly increased radiation resistance for the lithium counterdoped cells when compared to the boron doped 1 ohm-cm control cell. The increased radiation resistance of the lithium counterdoped cells is due to the complexing of lithium with divacancies and boron. It is speculated that complexing with oxygen and single vacancies also contributes to the increased radiation resistance. Counterdoping silicon with lithium results in a different set of defects. A.R.H.

N84-29323*# Massachusetts Inst. of Tech., Cambridge.
DEFECT INTERACTIONS IN GaAs SINGLE CRYSTALS Abstract Only **c76**
H. C. Gatos and J. Lagowski *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 111 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 20B

The two-sublattice structural configuration of GaAs and deviations from stoichiometry render the generation and interaction of electrically active point defects (and point defect complexes) critically important for device applications and very complex. Of the defect-induced energy levels, those lying deep into the energy band are very effective lifetime "killers'. The level 0.82 eV below the condition band, commonly referred to as EL2, is a major deep level, particularly in melt-grown GaAs. This level is associated with an antisite defect complex (AsGa - VAS). Possible mechanisms of its formation and its annihilation were further developed. Author

N84-29324*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EQUIVALENT ELECTRON FLUENCE FOR SOLAR PROTON DAMAGE IN GaAs SHALLOW JUNCTION CELLS
John W. Wilson and L. V. Stock (Old Dominion Univ.) *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 112-117 refs (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

The short-circuit current reduction in GaAs shallow junction heteroface solar cells was calculated according to a simplified solar cell damage model in which the nonuniformity of the damage as a function of penetration depth is treated explicitly. Although the equivalent electron fluence was not uniquely defined for low-energy monoenergetic proton exposure, an equivalent electron fluence is found for proton spectra characteristic of the space environment. The equivalent electron fluence ratio was calculated for a typical large solar flare event for which the proton spectrum is PHI(sub p)(E) = A/E(p/sq. cm) where E is in MeV. The equivalent fluence ratio is a function of the cover glass shield thickness or the corresponding cutoff energy E(sub c). In terms of the cutoff energy, the equivalent 1 MeV electron fluence ratio is r(sub p)(E sub c) = 10(9)/E(sub c)(1.8) where E(sub c) is in units of KeV. Author

N84-29325*# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
RESEARCH DIRECTIONS AND PROGRESS IN SERI ADVANCED HIGH EFFICIENCY CONCEPTS PROGRAM Abstract Only
John P. Benner and Lee A. Cole *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 118-119 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Novel solar cell designs and materials with the objective of achieving the maximum attainable photovoltaic conversion efficiencies are researched. Laboratory demonstrations of solar cells of greater than 30% efficiency under concentrated sunlight and thin film solar cells with one sun efficiencies of 17 to 20% are sought. These demonstrations are necessary intermediate steps towards the realization of very high efficiency, multi-bandgap, thin-film solar cells. Conversion efficiencies above 30% could be achieved by a cascade multijunction cell consisting of a high bandgap (1.7 eV) cell coupled optically and electrically on top of a lower bandgap (1.1 eV) cell. Recent improvements in peak currents of this interconnect are quite promising. However, this cell structure poses difficult problems for materials fabrication as a result of the combined requirements of choice of bandgaps, low defect density material, and high doping densities. Recent improvements in the quality of materials and newly proposed cell structures which may simplify fabrication are significant steps in the development of the multijunction concentrator solar cell. Author

N84-29326*# Lincoln Lab., Mass. Inst. of Tech., Lexington.
OPTIMAL DESIGN OF HIGH-EFFICIENCY SINGLE-JUNCTION AND TANDEM CONCENTRATOR SPACE CELLS AT 80 DEG C AND 100 SUNS
John C. C. Fan and B. J. Palm *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 120-127 refs Sponsored in part by the Dept. of the Air Force (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Computer analysis was used to determine the AMO conversion efficiency of single-junction crystalline cells, two-cell and three-cell crystalline tandem structures operating under 100 suns and at 80 C. For optimally designed devices, the calculated efficiencies are 24% for single-junction cells, 33 to 35% for two-cell tandem structures, and 37 to 39% for three-cell tandem structures. Practical efficiencies are expected to be about 15 relative percentage points lower in each case. Author

N84-29327*# Spire Corp., Bedford, Mass.
DEVELOPMENT OF GaAs/Si AND GaAs/Si MONOLITHIC STRUCTURES FOR FUTURE SPACE SOLAR CELLS
M. B. Spitzer, S. M. Vernon, R. G. Wolfson, and S. P. Tobin *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 128-139 refs Sponsored in part by SERI (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

The results of heteroepitaxial growth of GaAs and GaAlAs directly on Si are presented, and applications to new cell structures are suggested. The novel feature is the elimination of a Ge lattice transition region. This feature not only reduces the cost of substrate preparation, but also makes possible the fabrication of high efficiency monolithic cascade structures. All films to be discussed were grown by organometallic chemical vapor deposition at atmospheric pressure. This process yielded reproducible, large-area films of GaAs, grown directly on Si, that are tightly adherent and smooth, and are characterized by a defect density of 5 x 10(6) power/sq cm. Preliminary studies indicate that GaAlAs can also be grown in this way. A number of promising applications are suggested. Certainly these substrates are ideal for low-weight GaAs space solar ells. For very high efficiency, the absence of Ge makes the technology attractive for GaAlAs/Si monolithic cascades, in which the Si substrates would first be provided with a suitable p/n junction. An evaluation of a three bandgap cascade consisting of appropriately designed GaAlAs/GaAs/Si layers is also presented. Author

N84-29328*# Varian Associates, Palo Alto, Calif.
DEVELOPMENT OF A 30 PERCENT EFFICIENT 3-JUNCTION MONOLITHIC CASCADE SOLAR CELL
C. R. Lewis, W. T. Dietze, and M. J. Ludowise *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 140-147 refs Sponsored in part by SERI (For primary document see N84-29307 19-44)
(Contract NAS3-22232)
Avail: NTIS HC A12/MF A01 CSCL 10A

The individual subcells of the 3-junction monolithic cascade concentrator cell are grown lattice mismatched with respect to each other, if appropriate grading layers are inserted between the mismatched layers. Under these conditions, negligible degradation of the properties of either underlying or overlying material results, and high-efficiency subcells are produced by this technique.
Author

N84-29329*# Chevron Research Co., Los Angeles, Calif.
HIGH-EFFICIENCY SOLAR CELLS FABRICATED BY VACUUM MO-CVD
L. M. Fraas, J. A. Cape, L. D. Partain, and P. S. McLeod *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 148-154 refs (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

High-efficiency, monolithic, two-color, three-terminal solar cells were fabricated by a novel growth technique, vacuum metal-organic chemical vapor deposition. The technique uses the expensive metal alkyls efficiently and toxic gases sparingly. The fact that the outer chamber is constructed of nonbreakable stainless steel is an attractive safety feature associated with this deposition system.
Author

N84-29330*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PLASMON DEVICE DESIGN: CONVERSION FROM SURFACE TO JUNCTION PLASMONS WITH GRATING-COUPLERS Abstract Only
Lynn M. Anderson *In its* Space Photovoltaic Res. and Technol. 1983 1984 p 155 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Scaling calculations and numerical studies are used to show that grating couplers provide effective energy transfer between surface plasmons and slower modes localized in the tunnel diodes. Within first order perturbation theory in grating amplitude, 90% efficiency energy transfer occurs within micrometers for realistic structures and materials parameters. Scaling laws are derived. Seventy to 90% of the electromagnetic field energy is concentrated in the oxide layer of an MOM diode after the energy is distributed by longer range modes that have less than 0.1% overlap with the tunneling region. The mode conversion allows the requirements separation for energy transport and power production by inelastic tunneling.
M.A.C.

N84-29331*# California Univ., Irvine.
INTERACTIONS BETWEEN VOLUME AND SURFACE EM WAVES IN LAYERED STRUCTURES Abstract Only
S. Ushioda *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 156 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Using light scattering spectroscopy, the interaction of Surface Plasmon Polariton SPP in silver films on a glass substrate is with the incident radiation and with optical phonons of an external medium in contact with the film. The mean free path and the field strength of SPP are determined. The same SPP plays an important role in light emitting tunnel junctions (LETJ) in which an electrical current is converted into Volume Electromagnetic Wave VEW. The efficiency of light emission from LETJ through a prism coupler rather than through surface roughness is discussed. The coupling between phonon surface polaritons (PhSP) and optical guided waves (OGW) in thin films of GaP is also examined.
M.A.C.

N84-29332*# TRW Space Technology Labs., Redondo Beach, Calif.
PRELIMINARY CONCEPT OF A 100-KILOWATT MINIATURIZED CASSEGRAINIAN CONCENTRATOR SOLAR ARRAY
Robert E. Patterson *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 157-162 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

A miniaturized Cassegrainian concentrator (MCC) solar array system is examined to assess the practicality of assembling the basic MCC element into a total array system capable of producing multi-hundred kilowatts of power for Space Platform/Space Station or other low Earth orbit long lifetime missions. Preliminary mechanical and electrical subsystems are developed in order to determine first order performance characteristics. Results of the study support the feasibility of a 100-kilowatt MCC array system with beginning-of-life (BOL) performance of 160 watts per square meter and 28 W/kg. The performance numbers are based on 20 percent efficient (at operating temperature) solar cells and 0.25-millimeter thick electroformed nickel optics. These performance numbers can be improved upon significantly with the development of higher efficiency solar cells and/or lighter weight optics.
M.A.C.

N84-29333*# Rockwell International Corp., Los Angeles, Calif.
PERFORMANCE MEASUREMENT OF LOW CONCENTRATION RATIO SOLAR ARRAY FOR SPACE APPLICATION
Michael W. Mills *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 163-175 refs (For primary document see N84-29307 19-44)
(Contract NAS8-34214)
Avail: NTIS HC A12/MF A01 CSCL 10A

The measured performance of a silicon and a gallium arsenide low concentration ratio solar array (LCRSA) element is presented. The element characteristics measured in natural sunlight are off pointing performance and response to mechanical distortions. Laboratory measurements of individual silicon and gallium-arsenide solar cell assemblies are also made. The characteristics measured in the laboratory involved responses to temperature and intensity variations as well as to the application of reverse bias potentials. The element design details covered include the materials, the solar cells, and the rationale for selecting these specific characteristics. The measured performance characteristics are contrasted with the predicted values for both laboratory testing and high altitude natural sunlight testing. Excellent agreement between analytical predictions and measured performance is observed.
M.A.C.

N84-29334*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PREFLIGHT STUDY OF SAN MARCO D/L GaAs SOLAR CELL PANELS
John H. Day, Jr. *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 176-181 refs (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

The solar array for the San Marco D/L spacecraft is described and the performance of 4 GaAs solar cell panels are examined. In comparison to the typical Si solar cell panel for San Marco D/L, it is shown that each GaAs solar cell panel provides at least 23 percent more specific power at maximum output and 28 deg C. Also described here, are several measurements that will be made to evaluate the relative performance of Si and GaAs solar cell panels during the San Marco D/L flight.
M.A.C.

N84-29335*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRELIMINARY SPACE STATION SOLAR ARRAY STRUCTURAL DESIGN STUDY
John T. Dorsey, Harold G. Bush, and Martin M. Mikulas, Jr. *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 182-192 refs (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Structurally efficient ways to support the large solar arrays (3,716 square meters which are currently considered for space station use) are examined. An erectable truss concept is presented for the on orbit construction of winged solar arrays. The means for future growth, maintenance, and repair are integrally designed into this concept. Results from parametric studies, which highlight the physical and structural differences between various configuration options are presented. Consideration is given to both solar blanket and hard panel arrays. M.A.C.

N84-29336*# Astro Research Corp., Santa Barbara, Calif.
DEVELOPMENT AND SUPPORT STRUCTURES FOR HIGH-POWER SOLAR ARRAYS
Karl Knapp *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 193-204 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

A number of structurally efficient configurations for wing-type solar arrays are developed by a combination of deepening the planform of the blanket and structure and by partitioning the blanket with battens and frequent attachments to the support structure. This technique reduces the tension required to avoid a low natural frequency for the blanket, and the load reduction results in a lighter structure. The use of three different structures are investigated: the Astromast, the Extendible Support Structure (ESS), and a new beam called the STACBEAM (Stacking Triangular Articulated Compact Beam) and their relative performances are compared. The investigation of the STACBEAM is emphasized because its sequential deployment is more reliable for very long systems, and its linear deployment facilitates local attachments to the blanket and the development of a low mass deployer. M.A.C.

N84-29337*# Spectrolab, Inc., Sylmar, Calif.
PANEL FABRICATION UTILIZING GaAs SOLAR CELLS
N. Mardesich *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 205-209 ref (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

The development of the GaAs solar cells for space applications is described. The activities in the fabrication of GaAs solar panels are outlined. Panels were fabricated while introducing improved quality control, soldering laydown and testing procedures. These panels include LIPS II, San Marco Satellite, and a low concentration panel for Rockwells' evaluation. The panels and their present status are discussed. E.A.K.

N84-29338*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
TRANSPARENT ARRAYS: PROGRESS TOWARD HIGHER EFFICIENCY
G. J. Pack *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 210-219 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Principles and design considerations of IR transparent solar arrays are discussed. Optimization of performance of flexible solar arrays was studied. Measured solar absorptance as low as alpha s = 0.59 was achieved which leads to a predicted BOL power density of 182.7 = W/square meters. Advanced array concepts, system level cascaded panels, and transparent rigid panels are proposed and expected benefits discussed. E.A.K.

N84-29339*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE NASA WELDING ASSESSMENT PROGRAM **c39**
John Scott-Monck and John Bozek (NASA. Lewis Research Center) *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 220-222 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 13I

The potential cost and performance advantages of welding was understood but ignored by solar panel manufacturers in the U.S. Although NASA, DOD and COMSAT have supported welding development efforts, soldering remains the only U.S. space qualified method for interconnecting solar cells. The reason is that no U.S. satellite prime contractor found it necessary, due to mission requirements, to abandon the space proven soldering process. It appears that the proposed NASA space station program will provide an array requirement, a 10 year operation in a low Earth orbital environment, that mandates welding. The status of welding technology in the U.S. is assessed. E.A.K.

N84-29340*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH SPEED, LOW COST, LEO-THERMAL-CYCLING FACILITY
R. E. Hart, Jr. and L. G. Sidorak *In its* Space Photovoltaic Res. and Technol. 1983 1984 p 223-227 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

The design and operations of a low cost, high rate thermal cycling facility designed for LEO conditions is described. Thermal cycling facilities were constructed with various design criteria. Some were designed to duplicate as closely as possible the conditions a cell or module would encounter while in orbit about the Earth. A typical facility to perform this type of cycling was a large vacuum system with liquid nitrogen cooled walls. The cells were heated by an AMO spectrum solar simulator, then a shutter was closed allowing the cells to give up their heat to the cold walls. This system was good at duplicating the orbital conditions but was slow and very costly to operate. Other systems used a gas atmosphere and heated the cells with radiant heat and cooled the cells by moving them into close proximity to a cold plate. The systems greatly increased the cycle times. Other systems moved the heating and cooling atmosphere into and out of the test areas and achieved reasonable cycle rates. All these systems, however, are expensive to operate. E.A.K.

N84-29341*# Spectrolab, Inc., Sylmar, Calif.
IMPROVED TECHNIQUES OF PARALLEL GAP WELDING AND MONITORING **c37**
N. Mardesich and M. S. Gillanders *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 228-234 ref (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 13I

Welding programs which show that parallel gas welding is a reliable process are discussed. When monitoring controls and nondestructive tests are incorporated into the process, parallel gap welding becomes more reliable and cost effective. The panel fabrication techniques and the HAC thermal cycling test indicate reliable product integrity. The design and building of automated tooling and fixturing for welding are discussed. E.A.K.

N84-29342*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELECTROCHEMICAL STORAGE Abstract Only
Lawrence H. Thaller *In its* Space Photovoltaic Res. and Technol. 1983 1984 p 235 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10C

The source of the problem within the individual single cell which is related to the stochastic properties of cell populations and to the actual electrochemistry and chemistry taking place is described. The complications which arise in multicell batteries to show how different electrochemistries might alleviate or accentuate these problems is described. The concept of the electrochemical system is introduced to show how certain shortcomings of the single cell/battery string concept can be circumvented. Some of these electrochemical systems permit performance characteristics that are impossible by using conventional battery design philosophies. Projections for energy density and performance characteristics of the concepts are addressed. E.A.K.

N84-29343*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOLAR ARRAY: PLASMA INTERACTIONS Abstract Only
Carolyn K. Purvis *In its* Space Photovoltaic Res. and Technol. 1983 1984 p 236 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Interactions between space systems and their orbital particle and field environments have significant impact on the system's operation and life. Interactions such as radiation damage and aerodynamic drag are considered in designing space systems. There are, however, a number of orbital environmental interactions which become important design considerations only for large or high power systems. Their impact is assessed to ensure successful design. Interactions between higher voltage solar arrays and the space plasma which are of critical concern in designing large orbital photovoltaic power systems are outlined. E.A.K.

N84-29344*# National Aeronautics and Space Administration, Washington, D. C.
SPACE STATION **c18**
A. F. Forestieri *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 237-250 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 22B

The need for a space station, its cost, its use, and completion are examined. The Space Station Task Force was established by NASA Administrators to answer questions and to provide focus and direction for Space Station planning activities. The task force provides Congress and the Administration with sufficient information to make decisions on whether the United States should proceed with a Space Station as the next major national initiative in space. Current thinking on selected issues, planning guidelines, unique considerations and organization are presented. E.A.K.

N84-29345*# Lincoln Lab., Mass. Inst. of Tech., Lexington.
HIGH-EFFICIENCY CONVENTIONAL CELLS WORKSHOP
John C. C. Fan *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 251-252 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 10A

Participants expressed more interest in GaAs cells than in Si cells. For silicon cells, the beginning of life efficiency is not a major problem but more research is needed in the end of life efficiency. The beginning of life efficiency of GaAs cells must be brought up to 20% at AMO. More proton damage tests must be conducted. Liquid phase epitaxy technology is current but chemical vapor deposition technology is more flexible. There are no obvious problems in limiting process yields. Technology transfer should occur when market demands are generated. A.R.H.

N84-29346*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RADIATION DAMAGE WORKSHOP **c72**
Paul M. Stella *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 253-254 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 20H

The availability of data regarding the radiation behavior of GaAs and silicon solar cells is discussed as well as efforts to provide sufficient information. Other materials are considered too immature for reasonable radiation evaluation. The lack of concern over the possible catastrophic radiation degradation in cascade cells is a potentially serious problem. Lithium counterdoping shows potential for removing damage in irradiated P-type material, although initial efficiencies are not comparable to current state of the art. The possibility of refining the lithium doping method to maintain high initial efficiencies and combining it with radiation tolerant structures such as thin BSF cells or vertical junction cells could provide a substantial improvement in EOL efficiencies. Laser annealing of junctions, either those formed ion implantation or diffusion, may not only improve initial cell performance but might also reduce the radiation degradation rate. A.R.H.

N84-29347*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF VORTEX GENERATORS ON THE POWER CONVERSION PERFORMANCE AND STRUCTURAL DYNAMIC LOADS OF THE MOD-2 WIND TURBINE Final Report
Timothy L. Sullivan Jun. 1984 29 p refs
(Contract DE-AI01-76ET-20320)
(NASA-TM-83680; E-2131; DOE/NASA/20320-59; NAS 1.15:83680) Avail: NTIS HC A03/MF A01 CSCL 10A

Applying vortex generators from 20 to 100 percent span of the Mod-2 rotor resulted in a projected increase in annual energy capture of 20 percent and reduced the wind speed at which rated power is reached by nearly 3 m/sec. Application of vortex generators from 20 to 70 percent span, the fixed portion of the Mod-2 rotor, resulted in a projected increase in annual energy capture of about half this. This improved performance came at the cost of a small increase in cyclic blade loads in below rated power conditions. Cyclic blade loads were found to correlate well with the change in wind speed during one rotor revolution. Author

N84-29348*# Union Carbide Corp., Tonawanda, N.Y.
FLAT-PLATE SOLAR ARRAY PROJECT: EXPERIMENTAL PROCESS SYSTEM DEVELOPMENT UNIT FOR PRODUCING SEMICONDUCTOR-GRADE SILICON USING THE SILANE-TO-SILICON PROCESS Final Report, Apr. 1979 - Dec. 1981
[1983] 356 p Prepared for JPL, Pasadena, Calif.
(Contract JPL-954334)
(NASA-CR-173762; NAS 1.26:173762; UC-63) Avail: NTIS HC A16/MF A01 CSCL 10A

The process technology for the manufacture of semiconductor-grade silicon in a large commercial plant by 1986, at a price less than $14 per kilogram of silicon based on 1975 dollars is discussed. The engineering design, installation, checkout, and operation of an Experimental Process System Development unit was discussed. Quality control of scaling-up the process and an economic analysis of product and production costs are discussed. R.J.F.

N84-29349*# Meridian Corp., Falls Church, Va.
SYNTHESIS OF MAJOR ECONOMIC STUDIES OF RESIDENTIAL PHOTOVOLTAICS Final Report
30 Apr. 1984 32 p refs Prepared for JPL, Pasadena, Calif.
(Contract JPL-956685)
(NASA-CR-173766; NAS 1.26:173766) Avail: NTIS HC A03/MF A01 CSCL 10A

Six studies that analyze the cost effectiveness of grid connected residential photovoltaic systems are reviewed. These six studies were selected based on two criteria. First, the reports share common emphases on developing photovoltaic systems with certain engineering design goals in mind, and on performing economic analyses to assess the long term economic potential of the system design. The economic analyses presented are performed from the consumer's perspective. Author

N84-29350*# Ross (Bernd) Associates, San Diego, Calif.
DEVELOPMENT OF AN ALL-METAL THICK FILM COST EFFECTIVE METALLIZATION SYSTEM FOR SOLAR CELLS Final Report, May 1980 - Jan. 1983
Bernd Ross and Joseph Parker Dec. 1983 133 p refs Sponsored in part by DOE
(NASA-CR-173760; DOE/JPL-955688-82/10; NAS 1.26:173760) Avail: NTIS HC A07/MF A01 CSCL 10A

Improved thick film solar cell contacts for the high volume production of low cost silicon solar arrays are needed. All metal screenable pastes made from economical base metals and suitable for application to low to high conductivity silicon were examined. Silver fluoride containing copper pastes and fluorocarbon containing copper pastes were discussed. The effect of hydrogen on the adhesion of metals to silicon was investigated. A cost analysis of various paste materials is provided. R.S.F.

N84-29351*# Florida Univ., Gainesville.
SURFACE AND ALLIED STUDIES IN SILICON SOLAR CELLS Quarterly Technical Report, Aug. - Oct. 1983
F. A. Lindholm Nov. 1983 39 p refs Sponsored in part by DOE
(Contract JPL-956525)
(NASA-CR-173761; JPL-9950-895; DOE/JPL-956252-83/1; NAS 1.26:173761; QTR-1; DRL-198) Avail: NTIS HC A03/MF A01 CSCL 10A

Two main results are presented. The first deals with a simple method that determines the minority-carrier lifetime and the effective surface recombination velocity of the quasi-neutral base of silicon solar cells. The method requires the observation of only a single transient, and is amenable to automation for in-process monitoring in manufacturing. This method, which is called short-circuit current decay, avoids distortion in the observed transient and consequent inacccuracies that arise from the presence of mobile holes and electrons stored in the p/n junction spacecharge region at the initial instant of the transient. The second main result consists in a formulation of the relevant boundary-value problems that resembles that used in linear two-port network theory. This formulation enables comparisons to be made among various contending methods for measuring material parameters of p/n junction devices, and enables the option of putting the description in the time domain of the transient studies in the form of an infinite series, although closed-form solutions are also possible.
M.G.

N84-29352*# Oregon State Univ., Corvallis. Dept. of Chemical Engineering.
PRELIMINARY STUDY OF A RADIANTLY HEATED FLUIDIZED BED FOR THE PRODUCTION OF HIGH PURITY SILICON Final Report
Octave Levenspiel, Milton Larson, Guo-Tai Zhang, and Fan Ouyang Aug. 1983 43 p refs Sponsored in part by DOE
(Contract JPL-956133)
(NASA-CR-173758; DOE/JPL-956133-83/1; JPL-9950-857; NAS 1.26:173758) Avail: NTIS HC A03/MF A01 CSCL 10A

The preparation of very pure silicon from silane (SIH4) using radiant heating of the hot silicon particles of a fluidized bed is discussed. The fraction of electrical energy supplied to the heater which is actually absorbed by the particles and the heat transfer coefficient between the hot bed and the cool distributor plate were investigated. The experimental design is presented and the results of the study are summarized. R.S.F.

N84-29353*# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
PROCESS RESEARCH OF NON-CZ SILICON MATERIAL Quarterly Report, 1 Jan. - 31 Mar. 1984
R. B. Campbell [1984] 22 p Sponsored in part by DOE
(Contract JPL-956616)
(NASA-CR-173759; DOE/JPL-956616-83/2; JPL-9950-918; NAS 1.26:173759; WAESD-TR-84-0013; DRL-206; DRD-SE-5; QR-2) Avail: NTIS HC A02/MF A01 CSCL 10A

Advanced processing techniques for non-CZ silicon sheet material that might improve the cost effectiveness of photovoltaic module production were investigated. Specifically, the simultaneous diffusion of liquid boron and liquid phosphorus organometallic precursors into n-type dendritic silicon web was examined. The simultaneous junction formation method for solar cells was compared with the sequential junction formation method. The electrical resistivity of the n-n and p-n junctions was discussed. Further research activities for this program along with a program documentation schedule are given. R.S.F.

N84-29354*# Westinghouse Research and Development Center, Pittsburgh, Pa.
LASER-ASSISTED SOLAR CELL METALLIZATION PROCESSING Quarterly Report, 13 Sep. - 12 Dec. 1983
S. Dutta 16 Jan. 1984 33 p refs Prepared for JPL, Pasadena, Calif.
(Contract JPL-956615)
(NASA-CR-173764; DOE/JPL-956615-84/1; NAS 1.26:173764; DRD-SE5; DRL-203) Avail: NTIS HC A03/MF A01 CSCL 10A

Laser-assisted processing techniques utilized to produce the fine line, thin metal grid structures that are required to fabricate high efficiency solar cells are examined. Two basic techniques for metal deposition are investigated; (1) photochemical decomposition of liquid or gas phase organometallic compounds utilizing either a focused, CW ultraviolet laser (System 1) or a mask and ultraviolet flood illumination, such as that provided by a repetitively pulsed, defocused excimer laser (System 2), for pattern definition, and (2) thermal deposition of metals from organometallic solutions or vapors utilizing a focused, CW laser beam as a local heat source to draw the metallization pattern. M.A.C.

N84-29355*# Westinghouse Research and Development Center, Pittsburgh, Pa.
LASER-ASSISTED SOLAR CELL METALLIZATION PROCESSING Quarterly Report, 13 Dec. 1983 - 12 Mar. 1984
S. Dutta 3 Apr. 1984 30 p Prepared for JPL, Pasadena, Calif.
(Contract JPL-956615)
(NASA-CR-173763; DOE/JPL-956615-84/2; NAS 1.26:173763; DRD-SE5; DRL-203) Avail: NTIS HC A03/MF A01 CSCL 10A

Laser assisted processing techniques utilized to produce the fine line, thin metal grid structures that are required to fabricate high efficiency solar cells are investigated. The tasks comprising these investigations are summarized. Metal deposition experiments are carried out utilizing laser assisted pyrolysis of a variety of metal bearing polymer films and metalloorganic inks spun onto silicon substrates. Laser decomposition of spun on silver neodecanoate ink yields very promising results. Solar cell comb metallization patterns are written using this technique. M.A.C.

N84-29356*# National Aeronautics and Space Administration, Washington, D. C.
HYDROGEN STORAGE IN THE FORM OF METAL HYDRIDES
M. G. Zwanziger, C. C. Santana, and S. C. Santos May 1984 9 p refs Transl. into ENGLISH from the Proceedings of the 1st Conf. on Energy, Brazil, 1979 p 542-548 Conf. held at Rio de Janeiro, 12-14 Dec. 1978 Previously announced as A79-33251 Transl. by Scientific Translations, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-77453; NAS 1.15:77453) Avail: NTIS HC A02/MF A01 CSCL 10C

Reversible reactions between hydrogen and such materials as iron/titanium and magnesium/ nickel alloy may provide a means for storing hydrogen fuel. A demonstration model of an iron/titanium hydride storage bed is described. Hydrogen from the hydride storage bed powers a converted gasoline electric generator.
Author

N84-29357*# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Systems Technology.
WIND TURBINE GENERATOR INTERACTION WITH CONVENTIONAL DIESEL GENERATORS ON BLOCK ISLAND, RHODE ISLAND. VOLUME 1: EXECUTIVE SUMMARY Final Report
V. F. Wilreker, P. H. Stiller, G. W. Scott, V. J. Kruse, and R. F. Smith Feb. 1984 47 p refs
(Contracts DEN3-275; DEN3-354; DE-AI01-76ET-20320)
(NASA-CR-168318; DOE/NASA/0354-1; NAS 1.26:168318; AST-84-1808) Avail: NTIS HC A03/MF A01 CSCL 10B

Primary results are summarized for a three-part study involving the effects of connecting a MOD-OA wind turbine generator to an isolated diesel power system. The MOD-OA installation considered was the third of four experimental nominal 200 kW wind turbines connected to various utilities under the Federal Wind Energy Program and was characterized by the highest wind energy penetration levels of four sites. The study analyses address: fuel displacement, dynamic interaction, and three modes of reactive power control. These analyses all have as their basis the results of the data acquisition program conducted on Block Island, Rhode Island. A.R.H.

N84-29358*# Ionics, Inc., Watertown, Mass. Research Div.
ANION PERMSELECTIVE MEMBRANE Final Report
Russell B. Hodgdon, Warren A. Waite, and Samuel S. Alexander 17 Jul. 1984 48 p
(Contracts DEN3-264; DE-AI04-80AL-12726)
(NASA-CR-174725; DOE/NASA/0264-1; NAS 1.26:174725) Avail: NTIS HC A03/MF A01 CSCL 10A

Two polymer ion exchange membranes were synthesized to fulfill the needs of both electrical resistivity and anolyte/catholyte separation for utility load leveling utilizing the DOE/NASA mixed

electrolyte REDOX battery. Both membranes were shown to meet mixed electrolyte utility load leveling criteria. Several modifications of an anion exchange membrane failed to meet utility load leveling REDOX battery criteria using the unmixed electrolyte REDOX cell. Author

N84-29359# Army Construction Engineering Research Lab., Champaign, Ill.
PROCEDURES FOR ACCEPTANCE TESTING OF SOLAR ENERGY SYSTEMS Final Report
D. L. Johnson and D. M. Joncich Apr. 1984 42 p
(DA Proj. 4A7-62781-AT-45)
(AD-A141839; CERL-TR-E-192) Avail: NTIS HC A03/MF A01 CSCL 14/2

This report describes research on the use of simple, low-cost meters for measuring the performance of solar energy systems in Army buildings and for comparing the measured performance with the design specification requirements. The requirements of meters for measuring the performance of solar energy systems were defined. A BTU-Meter for measuring heat transfer was designed, and commercial meters for taking other measurements were obtained. The meters were installed in a solar system in the laboratory and a pilot test of the acceptance test was done. Suggested draft revisions to Corps of Engineers design documents were prepared; designers could use these revisions to include acceptance testing provisions in solar energy system design. It was found that in a short-duration test, simple, low-cost meters can be used to determine whether a newly installed solar energy system is operating as specified. The simplicity of the metering approach allows designers to routinely include metering in the solar system design. The contractor can easily install the meters with the other solar components. Since the meters are so versatile, they can be used continuously for long-term performance monitoring. This gives the designer performance data and allows maintenance personnel to detect and diagnose solar equipment malfunctions. Thus, solar energy system metering can provide a unified, low-cost approach for meeting the wide range of measurement needs of Army solar energy systems. Author (GRA)

N84-29360# Wisconsin Univ., Madison. Dept. of Chemistry.
ZINC SELENIDE PHOTOELECTRODES. EFFICIENT RADIATIVE RECOMBINATION IN A STABLE PHOTOELECTROCHEMICAL CELL
P. M. Smiley, R. N. Biagioni, and A. B. Ellis 25 May 1984 30 p
Previously announced as A84-33433
(Contract N00014-78-C-0633)
(AD-A141869; UWIS/DC/TR-84/1) Avail: NTIS HC A03/MF A01 CSCL 10/2

Photoluminescence (PL) and electroluminescence (EL) from single-crystal, n-type, A1-doped ZnSe (ZnSe:A1) electrodes have been studied. These samples exhibit both edge emission (lambda (max) approx. 460 nm) and subband gap emission when excited at several ultraband gap wavelengths. The latter PL band is particularly intense, with a measured radiative quantum yield of approx. 0.1 to 0.01; the transition seems at least partially self-activated (SA) in origin, based on previously reported PL data. Excited-state communication involving the two emissive states is inferred from time-resolved PL measurements. Stable photoelectrochemical cells (PEC's) can be constructed from n-ZnSe:A1 electrodes and aqueous diselenide or ditelluride electrolytes. Applied potential quenches both of the photoanodes' PL bands roughly in parallel. The extent of PL quenching is consistent with a dead-layer model previously used to describe quenching in Au-ZnSe Schottky diodes. When used as a dark cathode in aqueous, alkaline peroxydisulfate eletrolyte, EL from ZnSe:A1 electrodes is observed. GRA

N84-29361# Department of the Navy, Washington, D. C.
DUAL ELECTROCHEMICAL SYSTEM Patent Application
J. R. Moden, inventor (to Navy) Filed 26 Jan. 1984 10 p
(AD-D011035; US-Patent-Appl-SN-573904) Avail: NTIS HC A02/MF A01 CSCL 10/2

This inventions provides a means to increase the energy density of two electrochemical systems by using the by-product of each system as one of the necessary ingredients of the reactants of the other system. For example: (1) 2 Li + H2O2 yields 2LiOH (2) 2 LiOH + 3H2O2 + 2Al yields 2LiAlO2 + 4H2O where the LiOH from (1) is used in (2) and the H2O from (2) is used to fulfill the dilution requirements of (1). GRA

N84-29362# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
ENVIRONMENTAL DEGRADATION OF SOLAR OPTICAL MATERIALS, VOLUME 2
C. J. Kojima and C. A. Smith Jan. 1984 337 p refs
(Contract DE-AC04-76DP-00789)
(DE84-006505; SAND-82-7068-2) Avail: NTIS HC A15/MF A01

Exposure of solar optical materials to use environments results in degradation of the materials. Degradation effects can be evaluated by measurements of the appropriate optical properties. In situ environmental exposure tests were conducted at two locations. Both reflecting and transmitting materials were evaluated for changes in optical properties due to environmental effects. These results were computerized along with information obtained from the literature survey summarized in Volume 1 of this report. The computerized data base was used for an analysis and correlation of degradation in optical properties' values with selected environmental test site parameters. Optical properties for reflecting and transmitting materials were investigated as well as differing exposure test techniques and optical properties measurement methods. Modeling of optical properties degradation was studied for various materials in the solid condition and following a cleaning procedure. DOE

N84-29363# Bryant (Paul J.), Prairie Village, Kans.
OPTIMIZATION OF WIND TURBINE DESIGN FOR SWECS Final Report, 1 Oct. 1981 - 1 Oct. 1983
Paul J. Bryant 1983 5 p
(Contract DE-FG47-81R7-01221)
(DE84-009759; DOE/R7-01221/T4) Avail: NTIS HC A02/MF A01

Current research to optimize wind turbine designs centers on the most important parameter, the useful lifetime of the rotor assembly. A rotor design which promises to extend the lifetime of the full rotor assembly is discussed. That design improvement includes the integration of a teetered rotor hub and a delta-3 angle. This design concept was proven in helicopter and rotor craft applications. The adaptation to wind turbines was the primary task of this appropriate technology utilization project. Test rotors, incorporating the teetering hub, delta-3 angle design, were constructed and tested. The research model provides a full range of settings for a complete evaluation of the relevant parameters; e.g., the delta-3 angle is variable from +70 to -70(0), the rotor position may be varied fore and aft of the teeter axis, the teeter spring rate is continuously variable, also the teeter and yaw stops are adjustable. The use of a dc generator permits the rotor to change angular speed with wind speed. The lack of a yaw drive allows the rotor to display its own passive yawing rates and accommodation factors as a function of delta-3 angle, rotor axis position, and teeter spring rate settings. DOE

N84-29364# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
WIND ENERGY CONVERTER GROWIAN 2 Final Report, Jun. 1983
Dieter Braun, Valentin Kloeppel, Guenther Marsch, Rudolf Meggle, Rainer Mehlhose, Bernd Schoebe, and Roland Wennekers Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 148 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-063; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 31

Multi MW wind energy conversion systems in the rotor class of 135 m diam are described. A variable-speed horizontal-axis downwind machine with a one-bladed teetering rotor and a guyed

soft steel tower was investigated and a 1 to 3 scaled demonstrator with a rotor diameter of 48 m was built. The demonstrator will undergo a 2 year verification test program. Author (ESA)

N84-29267# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
FOSSIL FUELS
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983 p 21-42 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N84-29365# Institute for Energy Analysis, Oak Ridge, Tenn.
CARBON DIOXIDE EMISSIONS FROM FOSSIL FUELS: A PROCEDURE FOR ESTIMATION AND RESULTS FOR 1950 - 1981
Gregg Marland and Ralph M. Rotty Jun. 1983 78 p refs Sponsored in cooperation with Gas Research Inst.
(Contract DE-AC05-760R-00033)
(DOE/NBB-0036) Avail: NTIS HC A05/MF A01

A procedure to estimate CO(2) emissions from fossil fuels is presented. Rate estimates for CO(2) release are also included. The amount of fuel produced, the oxidized fraction, and the carbon content of the fuel contribute to the global emissions calculation. This method agrees with previous techniques. M.A.C.

N84-29366# Finnish Meteorological Inst., Helsinki.
DEVELOPMENT OF AIR SULFUR CONCENTRATION IN FINLAND THROUGH THE YEAR 2000 [ILMAN RIKKIPITOISUUDEN KEHITYKSESTAE SUOMESSA VUOTEEN 2000]
Alec Estlander 1982 85 p refs In FINNISH
(ISBN-951-697-178-4; ISSN-0355-1717) Avail: NTIS HC A05/MF A01

The Finnish regional development of sulfur dioxide and sulfate concentrations was examined. International predictors concerning emissions development were used to evaluate regional development of emissions levels in Finland. Future concentrations were estimated with the use of linear connections between emissions and concentrations obtained with a trajectory model developed in long-range transport studies. The findings indicate that the Finnish regional sulfur dioxide levels will not increase appreciably by 1985, but that sulfate concentrations will rise significantly. By the years 1990 and 2000, sulfur dioxide levels will be twice as high as they are at present, and sulfate levels will increase by fifty percent. In the larger Finnish cities, long-term averages of local sulfur dioxide concentrations are affected by temperature and the degree of district heating. Local long-term concentrations are expected to decrease in Finnish cities by the end of the century, but this effect will be offset by regional increases. Development of short-term concentrations appears to be totally dependent on local circumstances. Author

N84-29367# Oak Ridge National Lab., Tenn.
PROBLEM DEFINITION STUDY ON EMISSION BY-PRODUCT HAZARDS FROM DIESEL ENGINES FOR CONFINED SPACE ARMY WORKPLACES Final Report
D. M. Opresko, J. W. Holleman, R. H. Ross, and J. W. Carroll Apr. 1984 232 p
(AD-A141377; ORNL-6017) Avail: NTIS HC A11/MF A01 CSCL 21/7

A review of the available literature was undertaken to identify and characterize diesel exhaust emissions, to identify the factors which determine exhaust composition, to relate the potential effects of exhaust composition to air quality of confined space workplaces, and to evaluate the monitoring and modeling methodology which has been used to ensure that air quality standards are maintained under such conditions. GRA

N84-29368# Sierra Geophysics, Inc., Redmond, Wash.
A REAL-TIME AIR DISPERSION MODELING SYSTEM Final Report, Jul. 1982 - Dec. 1983
D. E. Bleeker, G. Garrabrant, and G. G. Worley Tyndall AFB, Fla. AFESC Apr. 1984 158 p
(Contract F08635-82-C-0374; AF Proj. 2103)
(AD-A141405; AFESC/ESL-TR-83-63) Avail: NTIS HC A08/MF A01 CSCL 09/2

This report documents a microcomputer-based system for the real-time computation of toxic corridors associated with chemical releases. The program assists the user with interactive input of critical meteorological parameters and accesses user-specified data bases of information regarding toxic chemical attributes. Graphic displays show the analyst the resulting toxic corridor superimposed upon site-specific base maps. The program is documented for the user thorough help files. An archive mode provides a chronological history of all events, including the time and date of each calculation. The program is modular in design, allowing for modifications and upgrades in the future. Author (GRA)

N84-29369# Army Construction Engineering Research Lab., Champaign, Ill.
COMMUNITY REACTION TO IMPULSIVE NOISE: A 10-YEAR RESEARCH SUMMARY Final Technical Report
P. D. Schomer and R. D. Neathammer Feb. 1984 209 p
(DA Proj. 4A1-62720-A-896)
(AD-A141762; CERL-TR-N-167) Avail: NTIS HC A10/MF A01 CSCL 01/3

A major concern of Army planners is the trend toward siting off-installation housing and other noise-sensitive land uses in areas exposed to high noise levels produced by Army training or operational activities. To do effective noise-related assessments and planning the Army must be able to assess the community reaction to impulse noise. Impulsive noise is produced by Army noise sources like armor, artillery, and demolition. This collection of papers summarizes 10 years of work by the U.S. Army Construction Engineering Research Laboratory (CERL) in the area of community response to impulsive noise. It is based on laboratory tests using a blast noise simulator, a study of Army-wide noise compliants, and attitudinal surveys conducted at Fort Bragg, NC, and Fort Lewis, WA. The altitudinal surveys provide most of the data. GRA

N84-29370# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
AQUATIC PLANT CONTROL RESEARCH PROGRAM. EFFECTS OF ENDOTHALL TREATMENT ON PHOSPHORUS CONCENTRATION AND COMMUNITY METABOLISM OF AQUATIC COMMUNITIES Final Report
W. F. James Feb. 1984 87 p
(AD-A141830; WES/MP/A-84-1) Avail: NTIS HC A05/MF A01 CSCL 06/6

Herbicide treatment and macrophyte senescence may results in the recycling of phosphorus from aquatic weeds to nontarget species because the nutrient is rapidly leached from plant tissue. A field study and two microcosm experiments were conducted to examine changes in phosphorus, oxygen, and chlorophyll a concentrations after the application of the herbicide and endothall. In each microcosm experiment, Potamogeton crispus communities were housed in 57 lambda aquaria containing known standing crops of the test plant and sediment with a specific phosphorus adsorbing capacity. In the first microcosm experiment, the application of 2.0 ppm endothall caused plant death and a rapid, short term increase in soluble reactive phosphorus, presumably from excessive leaching during senescence. A second microcosm experiment, which employed six control and six experimentally treated systems, differed from microcosm experiment 1 in that the sediment used had a weak phosphorus adsorbing capacity. In addition, the metabolism of the total microcosm and three autotrophic components (macrophyte-epiphyte, planktonic, and benthic) were monitored to assess the effects of an herbicide perturbation on nontarget assemblages. GRA

N84-29371# Oak Ridge Associated Universities, Tenn. Inst. of Energy Analysis.
CHANGING PATTERN OF CARBON DIOXIDE EMISSIONS
Ralph M. Rotty, Gregg Marland, and Ned Treat Mar. 1984 26 p refs
(Contract DE-AC05-76OR-00033)
(DE84-010086; ORAU/IEA-84-1(M)) Avail: NTIS HC A03/MF A01

Calculations of global CO2 emission using fuel production data have demonstrated that the annual emissions rate grew at a rate of 4.5% per year before 1973 and about half that rate after 1973. However, in projecting future emissions, fuel consumption rather than production data should be considered. In this analysis the world was divided into six fuel-consuming segments, and for each segment growth in CO2 emissions during the past three decades was carefully analyzed. Not only have CO2 emissions from the developing nations been growing at a higher rate than those from the developed world, but the developing nations do not show the reduction in growth rate evident in the data for North America, Western Europe, and Japan following 1973. Data for nations with centrally planned economies do not show steady growth rates during either 1950 to 1973 or 1973 to 1980, nor is the typical discontinuity of 1973 evident. Projections for the future require an understanding of reasons for changes. Disaggregation of the data into homogeneous segments offers a start in this understanding. For the next few decades increases in atmospheric CO2 concentrations will be largely determined by fuel policies in the developed nations of the world, but before the middle of the next century, fuel policies of the rapidly growing nations will become extremely important, if not dominant, in the world CO2 picture. DOE

N84-29372# Danish Meteorological Inst., Copenhagen. Geofysisk Afdeling.
THULE GEOPHYSICAL OBSERVATORY: MAGNETIC RESULTS, 1978 Progress Report
1983 56 p refs
(ISBN-87-7478-211-8) Avail: NTIS HC A04/MF A01

The results of the standard observation carried out at the Thule magnetic laboratory in 1978 are presented. The measurements show hourly means of horizontal and vertical intensity and hourly means of magnetic declination. Diurnal extreme values and means diurnal inequalities are also given. Author (ESA)

N84-29373# National Bureau of Standards, Washington, D.C. Center for Radiation Research.
AN INVESTIGATION OF LYOLINESCENCE TECHNIQUES FOR APPLICATION IN RADIATION PROTECTION DOSIMETRY
Richard Hanig Aug. 1983 57 p refs
(PB83-263236; NBSIR-83-2734) Avail: NTIS HC A04/MF A01 CSCL 13B

A cooled liquid scintillation system with single-photon counting photomultiplier tubes was employed to increase the sensitivity of luminol-enhanced lyoluminescence (LL). The problems of reagent purity and mechanical mixing were studied. For the disaccharide trehalose, the lowest dose significantly different from background was at the 1.2-rad level for Co60 gamma rays, with a standard deviation of 33 percent. The system suffers from poor reproducibility in the mixing of the disaccharide with its solvent, and recommendations were made for improvements. Detector compounds of different hydrogen content were studied for possible application in neutron dosimetry and for their ability to retard free-radical recombination. The results were not conclusive. Enhancement of the LL effect was accomplished by radiation sensitization of solutions of trehalose with between 30 and 300 krad to water. The disaccharide was then recrystallized from solution, along with associated radiolysis products and, in some instances, with separately added chemical dopants. Preliminary intercomparison of these doped sugars with untreated materials at doses of 1, 5, and 10 rads indicates that they give a better signal-to-background ratio than the untreated disaccharide. A promising reacton model was tried which assumed a two-component exponential decay of light, multiplied by a first-order buildup term for the dissolving factor. The model seems to fit both the ordinary and luminol-enhanced LL glow-curves. Author (GRA)

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N84-29374*# Alabama Univ., Huntsville. School of Mathematical and Natural Sciences.
PLASMA AND MAGNETOSPHERIC RESEARCH Quarterly Progress Report, Mar. - May 1984
Richard H. Comfort and James L. Horwitz Jun. 1984 12 p refs (Contract NAS8-33982)
(NASA-CR-171080; NAS 1.26:171080) Avail: NTIS HC A02/MF A01 CSCL 04A

Research activities on the following topics were summarized: (1) software for the Space Plasma computer Analysis Network (SPAN), (2) plasmaspheric field-aligned temperature gradients, (3) the shift in spacecraft potential as a function of plasma density, (4) plasma flow, (5) the Fabry-Perot interferometer, and (6) the Differential Ion Flux Probe (DIFP). R.S.F.

N84-29375# Bureau of Mines, Washington, D. C.
FLUORSPAR
Lawrence Pelham 1983 16 p refs
Avail: NTIS HC A02/MF A01

Fluorspar is the commercial name for the mineral fluorite, which commonly occurs as calcium fluoride (CaF2). Fluorspar is the most important commercial source of fluorine, which is a pale-yellow corrosive gas. Fluorspar is considered a strategic and critical commodity because U.S. import reliance is greater than 85% and fluorspar is necessary in most steel and aluminum production processes. Fluorine compounds are also used in the production of nuclear fuel. The chemical and ceramic industries are also significant users of fluorspar. There are many other diverse uses of fluorspar including water fluoridation. Strategic uses of fluorspar were reviewed and fluorspar-related technologies were assessed. Fluorspar reserves and supply-demand relationships were summarized. Economic factors and problems and the impact of environmental requirements on the fluorspar industry were overviewed. R.S.F.

N84-29376# Academy of Sciences (USSR), Moscow.
REPEATED GRAVIMETRIC OBSERVATIONS (COLLECTION OF SCIENTIFIC WORKS)
1982 127 p refs In RUSSIAN
Avail: NTIS HC A07/MF A01

A collection of 19 papers on gravimetric principles is presented. The results of a comparison of absolute gravimeters are provided, and the effect of changes in the distribution of atmospheric masses on the acceleration of gravity was discussed. The effects of gravimetric control at a gas condensation site and the importance of calculating variations in altitude in interpreting variations in gravity were addressed. It was proposed that variations dependent on photonic geologic processes in the Sakhalin-Kuril region of the U.S.S.R. can be specified. An hypothesis was offered concerning the possible global reason for the instability of the Earth's gravitational field. Author

N84-29377# Physical Dynamics, Inc., Bellvue, Wash.
THE TRANSIENT GRAVITY WAVE CRITICAL LAYER Annual Report, 10 Feb. 1983 - 10 Feb. 1984
Timothy J. Dunkerton 9 Apr. 1984 61 p
(Contract F49620-83-C-0061; AF Proj. 2310)
(AD-A141095; PD-NW-84-310R; AFOSR-84-0334TR) Avail: NTIS HC A04/MF A01 CSCL 08/5

Numerical simulations of gravity wave, critical layer interactions are presented, which confirm theoretical predictions of critical layer behavior and explain important features of gravity wave observa-

tions in the atmosphere, including momentum deposition and convective wavebreaking. Author (GRA)

N84-29378# Naval Ocean Systems Center, San Diego, Calif.
SENSITIVITY OF A LIDAR INVERSION ALGORITHM TO PARAMETERS RELATING ATMOSPHERIC BACKSCATTER AND EXTINCTION Final Report
H. G. Hughes, D. H. Stephens, and J. A. Ferguson Apr. 1984 19 p
(F59-551)
(AD-A141565; NOSC/TD-695) Avail: NTIS HC A02/MF A01 CSCL 04/1

A lidar return from a homogeneous atmosphere is used to examine the sensitivity of an inversion algorithm to uncertainties in parameters in a power law relating backscatter to extinction. Author (GRA)

N84-29379# Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
A THREE-DIMENSIONAL DYNAMICAL-CHEMICAL MODEL OF THE MESOSPHERE AND LOWER THERMOSPHERE FOR UPPER ATMOSPHERIC RESEARCH Final Technical Report, 18 May 1981 - 30 Sep. 1983
F. N. Alyea 20 Jan. 1984 82 p
(Contract F19628-81-K-0045)
(AD-A142200; AFGL-TR-84-0070) Avail: NTIS HC A05/MF A01 CSCL 04/1

The recent appearance of new observational data from specialized satellites and rocket probes has led to increased interest in upper atmospheric processes. The work to be reported herein is of the current status of a limited three-dimensional model of the dynamical and important chemical processes which are known to take place in the mesosphere and lower thermosphere to an altitude of about 400 km above the earth's surface. The modeling approach taken was to make use of the dynamical schemes and simplified chemical treatments embodied in our three-dimensional Stratospheric Circulation Model (SCM) developed for the study of stratospheric ozone. This model has been running on the now defunct ILLIAC-4 vector computer at NASA's Ames Research Center in California. In addition to large changes required in the existing dynamics and chemistry to reform the model for thermospheric and mesospheric levels, it was also necessary to revise the code structure to accommodate the shift from the ILLIAC machine to the AFGL CDC-660 computer. Much of this work was accomplished on the NASA machines prior to the availability, through special modems and telephone connections, of the AFGL CDC-6600. Since that time the programs have been transferred to AFGL and, while not completed, tests of the model dynamics on that machine have been undertaken. GRA

N84-29380# Science Applications, Inc., McLean, Va. Radiation and Electromagnetics Div.
STUDY OF E-BEAM PROPAGATION IN THE IONOSPHERE AND MAGNETOSPHERE Final Report, 27 Jul. 1979 - 31 Dec. 1980
D. J. Strickland, H. W. Bloomberg, and D. L. Lin Hanscom AFB, Mass. AFGL Sep. 1983 69 p
(Contract F19628-79-C-0125)
(AD-A142206; SAI-102-83-07; AFGL-TR-84-0030) Avail: NTIS HC A04/MF A01 CSCL 01/4

A two-dimensional (r, E) Monte Carlo electron transport model has been developed to study the energy deposition and spreading of kilovolt electron beams in the ionosphere. MCBE is the name of the computer code incorporating the model. The beam electrons scatter and lose energy through particle-particle interactions. These processes are treated by applying the Goudsmit-Saunder multiple scattering formula and assuming energy loss is continuous. Results have been obtained for several beam energies and some have been compared to the results of Berger, et al., (1970). We obtain excellent agreement in the altitude profile of energy deposition, but poor agreement in spreading. We find there to be less spreading along with a weaker dependence of this spreading on the starting beam electron energy. An analytic model has been developed to test the numerical results and contains the magnitude and weak dependence on beam energy of the observed spreading. This model has now been published with a copy of the reprint appearing at the end of this report. Another aspect of the work has been to investigate the effect of plasma turbulence on beam propagation. GRA

N84-29381# Nova Univ., Dania, Fla. Oceanographic Center.
FIRST- AND SECOND-PHASE GRAVITY FIELD SOLUTIONS BASED ON SATELLITE ALTIMETRY
G. Blaha Jan. 1984 113 p
(Contract F19628-82-K-0007)
(AD-A142256; AFGL-TR-84-0083; SR-2) Avail: NTIS HC A06/MF A01 CSCL 08/5

The increasing accuracy of satellite altimetry and its growing use in the determination of the general circulation of the oceans provide the motivation for conceiving the most rigorous model possible in relating the pressure and geopotential gradients. In response to such a need, the standard derivation is refined through the inclusion of second-order effects. This refinement is carried out with extensive use of tensor notations. Since altimeter measurements are directly affected by the surface (geocentric) tide, an exact representation of the latter is important. An improvement of the altimeter model with tidal effects included is achieved by an adaptation of Schwiderski's formula giving the ocean bottom deformation due to ocean tidal loading. The resulting model for the bottom tide and, especially, for the surface tide can be used in conjunction with all of the tidal constituents. The point-mass adjustment model, based on the residuals from the spherical-harmonic adjustment of satellite altimetry, was recently modified to allow for an efficient, large-scale resolution of the geoidal detail. As an alternative to the point-mass adjustment (without tidal parameters), an approach is presented which is an adaptation of the collocation theory. GRA

N84-29382# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
THE GENERATION OF A MASS POINT MODEL FROM SURFACE GRAVITY DATA
H. Sunkel Dec. 1983 40 p
(Contract F19628-82-K-0017)
(AD-A142327; OSU/DGSS-353; AFGL-TR-83-0318; SR-4) Avail: NTIS HC A03/MF A01 CSCL 08/5

The generation of a point mass model from surface gravity data requires the employment of sophisticated techniques mainly because a large number of unknowns has to be determined from large number of data. The method proposed relies on the transformation of the problem into the frequency domain. The calculation of the coefficients of the transformation matrix requires the evaluation of an integral of an isotropic kernel with respect to a limited area on the unit sphere, if mean values are used as data. An optimal algorithm for the approximate calculation in the sense of Sard, using Peano's theorem for functions on a sphere, is presented. The relation between the depth of a point mass layer and the mean value block size is derived by comparing the spectrum of the two operators. GRA

N84-29383# Department of the Navy, Washington, D. C.
A METHOD FOR DETERMINING THE MAGNITUDE OF EARTH'S GRAVITY Patent Application
A. G. Evans, inventor (to Navy) Filed 27 Feb. 1984 21 p
(AD-D011042; US-Patent-Appl-SN-583562) Avail: NTIS HC A02/MF A01 CSCL 17/7

An improved method is described that directly and continuously determines the magnitude of the earth's gravity in relation to a user platform at one or more selected points on or above the Earth's surface. An improved Global Positioning System (GPS) is used to carry out the method and is made up of a plurality of (24) continuously orbiting GPS satellites that are arranged into 3 groups of 8 satellites with each group or constellation being disposed in its respective plane of a series of 3 longitudinal planes. Each plane is arranged in predetermined angular and spatial relation to the Earth's equatorial plane and the other planes of the series. Any GPS satellite continuously

transmits a pair of encoded RF signals at predetermined L-band frequencies. By virtue of this global arrangement of the 24 satellites, the antenna field of view of a user platform is capable of receiving at any time the encoded signals of at least six satellites. A geodetic receiver on the platform together with a receiver microprocessor, a navigation microprocessor, and a microcomputer progressively and continuously process signals received from the satellites for the ultimate purpose of comparing GPS determined vertical acceleration (that is normal to the Earth's modeled ellipsoid) with its platform-measured gravimeter acceleration (that is normal to the Earth's geoid) so as to determine, with greater accuracy, the gravity at one or more selected points. GRA

N84-29384# Washington State Dept. of Natural Resources, Olympia.
PREPARATION OF RESIDUAL GRAVITY MAPS FOR THE SOUTHERN CASCADE MOUNTAINS, WASHINGTON USING FOURIER ANALYSIS
D. M. Dishberger Apr. 1983 79 p refs
(Contract DE-AC07-79ET-27014)
(DE84-012546; DOE/ET-27014/T10) Avail: NTIS HC A05/MF A01

Gravity in the Cascade Mountains of Washington ws investigated. Baseline gravity data were collected for use in geothermal resource evaluation. A Fourier analysis method for separating residual and regional gravity anomalies from a complete Bouquer anomaly is described. The techniques was applied to gravity data from the Southern Cascade Mountains, Washington. Residual gravity anomaly maps at a scale of 1:250,000 are presented for various regional wavelength filters, and a power spectrum of the frequency components in the South Cascade gravity data is displayed. DOE

N84-29385# Danish Meteorological Inst., Copenhagen. Geofysisk Afdeling.
GODHAVN GEOPHYSICAL OBSERVATORY: MAGNETIC RESULTS, 1977 Progress Report
1983 57 p refs
(ISBN-87-7478-213-4) Avail: NTIS HC A04/MF A01

The results of the standard observation carried out at the Godhavn magnetic laboratory in 1977 are presented. The measurements show hourly means of horizontal and vertical intensity and hourly means of magnetic declination. Diurnal extreme values and mean diurnal inequalities are also given. Author (ESA)

N84-29386# Danish Meteorological Inst., Copenhagen. Geofysisk Afdeling.
THULE GEOPHYSICAL OBSERVATORY: MAGNETIC RESULTS, 1975 Progress Report
1983 53 p refs
(ISBN-87-7478-206-1) Avail: NTIS HC A04/MF A01

The results of the standard observation carried out at the Thule magnetic laboratory in 1975 are presented. The measurements show hourly means of horizontal and vertical intensity and hourly means of magnetic declination. Diurnal extreme values and mean diurnal inequalities are also given. Author (ESA)

N84-29387# Danish Meteorological Inst., Copenhagen. Geofysisk Afdeling.
THULE GEOPHYSICAL OBSERVATORY: MAGNETIC RESULTS, 1976 Progress Report
1983 56 p refs
(ISBN-87-7478-208-8) Avail: NTIS HC A04/MF A01

The results of the standard observation carried out at the Thule magnetic laboratory in 1976 are presented. The measurements show hourly means of horizontal and vertical intensity and hourly means of magnetic declination. Diurnal extreme values and mean diurnal inequalities are also given. Author (ESA)

N84-29388# Danish Meteorological Inst., Copenhagen. Geofysisk Afdeling.
THULE GEOPHYSICAL OBSERVATORY: MAGNETIC RESULTS, 1977 Progress Report
1983 56 p refs
(ISBN-87-7478-209-6) Avail: NTIS HC A04/MF A01

The results of the standard observation carried out at the Thule magnetic laboratory in 1977 are presented. The measurements show hourly means of horizontal and vertical intensity and hourly means of magnetic declination. Diurnal extreme values and mean diurnal inequalities are also given. Author (ESA)

N84-29389# Danish Meteorological Inst., Copenhagen. Geofysisk Afdeling.
THULE GEOPHYSICAL OBSERVATORY: MAGNETIC RESULTS, 1979 Progress Report
1983 56 p refs
(ISBN-87-7478-214-2) Avail: NTIS HC A04/MF A01

The results of the standard observation carried out a. the Thule magnetic laboratory in 1979 are presented. The measurements show hourly means of horizontal and vertical intensity and hourly means of magnetic declination. Diurnal extreme values and mean diurnal inequalities are also given. Author (ESA)

N84-29390# Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau (West Germany).
OBSERVATIONS OF FAST MAGNETOSPHERIC ECHOES OF ARTIFICIALLY INJECTED ELECTRONS ABOVE AN AURORAL ARC Final Report, Oct. 1983
Klaus Wilhelm, Christian Becker, and Rudolf Schmidt Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 87 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-84-014; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18,50

Fast magnetospheric echoes of artificially injected energetic electrons were studied in electron beam experiments using rocket-borne instrumentation. A total of 234 echoes were observed in a pitch angle range from 0 to 110 deg arc at energies of 1.87 and 3.90 keV. Over 90 echoes are unambigously identified with known accelerator operations at 2, 4 or 8 keV energy and highest current levels resulting in typical transit times of 400 msec. No echoes are found in the 7.9 keV detector channels. High energy electrons lead the lower energy ones by 50 msec. Adiabatic theory applied to these observations yields a reflection height of 3000 to 4000 km. Author (ESA)

N84-28840# Joint Publications Research Service, Arlington, Va.
JOINT SOVIET-AMERICAN PROJECT FOR DETECTION OF GRAVITATIONAL WAVES
V. Dubinsky *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 63-64 Transl. into ENGLISH from Izvestiya (USSR), 21 Nov. 1983 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28846# Joint Publications Research Service, Arlington, Va.
DIFFUSE AURORAL ZONE. PART 7: DYNAMICS OF EQUATORIAL BOUNDARY IN FIELD OF DIFFUSE ELECTRON SPILL IN EVENING SECTOR Abstract Only
L. M. Nikolayenko, Y. I. Galperin, Y. I. Feldshteyn, Z. A. Sovo, and Z. Kranye *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 68 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 876-884 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28850# Joint Publications Research Service, Arlington, Va.
ION MAKEUP IN UPPER ATMOSPHERE AFFECTED BY SOURCE OF X-RAY RADIATION Abstract Only
S. V. Avakyan *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 70 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 907-911 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28863# Joint Publications Research Service, Arlington, Va.
FEASIBILITY OF FORMATION OF DISCRETE DUST BELTS AROUND EARTH Abstract Only
Y. K. Gulak *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 85 Transl. into ENGLISH from Astron. Vestn. (USSR), v. 17, no. 4, Oct.-Dec. 1983 p 232-237 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28864# Joint Publications Research Service, Arlington, Va.
EARTH'S DUST ENVELOP Abstract Only
V. L. Barsukov and T. N. Nazarova *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 85 Transl. into ENGLISH from Astron. Vestn. (USSR), v. 17, no. 4, Oct.-Dec. 1983 p 238-243 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28869# Joint Publications Research Service, Arlington, Va.
DEEP CRUSTAL STRUCTURE ON SPACE IMAGES Abstract Only
G. A. Tumanyan *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 102 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 32-39 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-29266# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
MINERALS
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983 p 42-66 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

N84-29270# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
EARTHQUAKE HAZARDS
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983 p 69-71 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

N84-29272# Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
OVERSEAS PROGRAMS
In its Yearbook of the Bureau of Mineral Resources, Geol. and Geophys., Canberra, 1 Jul. 1982 - 30 Jun. 1983 30 Jun. 1983 p 75-83 (For primary document see N84-29266 19-42)
Avail: NTIS HC A08/MF A01

N84-29412# Academy of Sciences (USSR), Moscow.
THE SEISMOLOGICAL INVESTIGATIONS OF THE WORLD OCEAN: THE STATE OF THE PROBLEM
S. A. Boldyrev *In its* Seismological Res. on the World Ocean 1983 p 8-33 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

N84-29418# Academy of Sciences (USSR), Moscow.
T-PHASE RECORDING BY OBS NEAR THE CONJUGATION OF THE KURIL AND JAPAN TRENCHES
A. I. Ivaschenko, F. D. Zhuk, A. I. Spirin, R. R. Harvey, and S. L. Poole *In its* Seismological Res. on the World Ocean 1983 p 87-93 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

N84-29419# Academy of Sciences (USSR), Moscow.
DOMINANT DEPTH OF SOURCES IN THE KURIL-KAMCHATKA EARTHQUAKE FOCAL ZONE FROM OBSERVATIONS BY SURFACE AND BOTTOM STATIONS
S. A. Boldyrev *In its* Seismological Res. on the World Ocean 1983 p 94-103 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

N84-29420# Academy of Sciences (USSR), Moscow.
THE SEISMICITY OF THE CONTINENTAL SLOPE OF THE KURIL TRENCH FROM THE OBS OBSERVATIONS
A. I. Ivaschenko, C. U. Kim, F. D. Zhuk, and A. A. Lukashev *In its* Seismological Res. on the World Ocean 1983 p 104-116 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

N84-29421# Academy of Sciences (USSR), Moscow.
ON THE ELASTIC WAVE VELOCITY DISTRIBUTION BENEATH THE CONTINENTAL SLOPE OF THE KURIL TRENCH
A. I. Ivaschenko, C. U. Kim, and A. O. Bobkov *In its* Seismological Res. on the World Ocean 1983 p 117-126 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

N84-29422# Academy of Sciences (USSR), Moscow.
SEISMICITY OF THE NORTH-EASTERN SAKHALIN SHELF
L. C. Oskorbin *In its* Seismological Res. on the World Ocean 1983 p 127-133 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

N84-29423# Academy of Sciences (USSR), Moscow.
SEISMICITY OF ICELAND AND THE ADJOINING REGION OF THE ATLANTIC OCEAN
S. A. Boldyrev *In its* Seismological Res. on the World Ocean 1983 p 134-149 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N84-29391 Deutscher Wetterdienst, Offenbach am Main (West Germany).
CLIMATOLOGICAL AND STATISTICAL BASES TO EXPLAIN THE TREATMENT OF CLIMATE DATA [KLIMATOLOGISCHE UND STATISTISCHE GRUNDLAGEN ALS ERLAEUTERUNGEN FUER KLIMABEARBEITUNGEN]
A. Cappel, M. Kalb, and H. Schmidt 1983 16 p refs In GERMAN
Copyright. Avail: Issuing Activity

Explanations concerning climatological and statistical fundamentals are presented in order to facilitate the processing of climate data and to publish tables containing the necessary information for the user. Climatological elements and concepts (observation period, cloudiness, atmospheric pressure, humidity, air temperature, precipitation, range of sight, sunshine period, daily means, and wind), their definition, measurement and measuring units are presented. Averages and frequency distributions are explained.
Author (ESA)

N84-29392 Deutscher Wetterdienst, Offenbach am Main (West Germany).
REPORTS FROM THE GERMAN METEOROLOGICAL SERVICE. NUMBER 164: THE CLIMATE IN SELECTED AREAS OF THE FEDERAL REPUBLIC OF GERMANY, BREMEN [BERICHTE DES DEUTSCHEN WETTERDIENSTES, NR. 164: DAS KLIMA AUSGEWAEHLTER ORTE DER BUNDESREPUBLIK DEUTSCHLAND, BREMEN]
D. Baetjer and H.-J. Heinemann 1983 253 p refs In GERMAN; ENGLISH summary
(ISBN-3-8848-210-5; ISSN-0072-3410) Copyright. Avail: Issuing Activity

An historical survey of climatological observations in Bremen since the beginning of the 19th century is presented. All relevant

climatic elements and combinations in the form of tables and figures are interpreted. The analysis is based on climatic observations carried out at 07 a.m, 02 p.m. and 09 p.m. mean local time as well as on hourly synoptic data and evaluations of records. Mean and extreme values, totals and frequencies of the climatological elements are presented. Author (ESA)

N84-29393 Deutscher Wetterdienst, Offenbach am Main (West Germany).
REPORTS FROM THE GERMAN METEOROLOGICAL SERVICE. NUMBER 165: THE WIND CONDITIONS IN THE FEDERAL REPUBLIC OF GERMANY WITH A VIEW TO WINDPOWER UTILIZATION (ESPECIALLY NETWORK PLANNING). PART 3: INTERIOR. PART 4: HINTERLAND [BERICHTE DES DEUTSCHEN WETTERDIENSTES, NR. 113: DIE WINDVERHAELTNISSE IN DER BUNDESREPUBLIK DEUTSCHLAND IM HINBLICK AUF DIE NUTZUNG DER WINDKRAFT (INSBESONDERE VERBUNDNETZPLANUNG). TEIL 3: BINNENLAND. TEIL 4: KUESTENVORFELD]
Ch. Lefebvre, G. Jurksch, H. Schmidt, B. Morgeney, and M. Ulbricht-Eissing 1983 85 p refs In GERMAN; ENGLISH summary
(ISBN-3-88148-211-3; ISSN-0072-4130) Copyright. Avail: Issuing Activity

The wind conditions in Germany were investigated in order to find out if it is a practicable from a meteorological point of view to use networks of wind energy converters. The investigations are based on data sets for the period 1969 to 1974 from 59 weather stations which have a uniform height of anemometer (10 m above ground level). Author (ESA)

N84-29394 International Inst. for Applied Systems Analysis, Laxenburg (Austria).
ASSESSING THE IMPACT OF CLIMATIC CHANGE IN COLD REGIONS
M. L. Parry, ed. and T. R. Carter, ed. 1984 48 p refs Workshop of Intern. Study Conf. on the Sensitivity of Ecosystems and Soc. to Climatic Change; sponsored by WMO, United Nations Environment Program and ICSU Original contains color illustrations Sponsored by Austrian Government, World Resources Institute and United Nations Educational, Scientific and Cultural Organization (IIASA-SR-84-1) Avail: Issuing Activity

Methods for assessing and predicting the effects of climatic changes in cold regions are discussed. Instrumentally based scenarios are valid and realistic as inputs for impact analysis. They may also be used to supplement large-scale aspects of general circulation models (GCM) output in order to produce more detailed scenarios of a high-CO2 world. A greater compatibility between GCMs and impact models can be promoted by increasing the reliability and detail of GCM outputs and by reducing the quantity and detail required of input data for impact models. Further experiments that combine climate models and impact models are required. Unverified experiments indicate substantial changes in northern ecosystems and farming systems as a result of a doubling in the atmospheric CO2 concentration. There are advantages in expressing changes in climate as changes in the return period of specified extremes (instead of changes in the mean values of climatic variables). Author (ESA)

N84-29395# Lamont-Doherty Geological Inst., Palisades, N. Y.
VARIATION OF ARCTIC CLOUD COVER DURING SUMMER 1979, PART 1
G. J. Kukla 1984 70 p refs
(Contract DE-AC02-81EV-10665)
(DE84-008996; LDGO-84-2-Pt-1) Avail: NTIS HC A04/MF A01

The variation of arctic cloud cover in time and space during the summer of 1979 was charted from satellite imagery in 3 to 7 day intervals. Charts of the cloud cover in the Arctic Basin cover the period from May 17 through August 15. Three classes of cloud thickness were separately mapped. Optically thick clouds were found to be considerably less frequent than what would be expected from earlier analyses of ground and drifting station reports. The proportion of the thickest cloud category increased markedly in mid-June in connection with a traveling low pressure system which originated during early June in Central Asia, crossed the Pole on June 13th and dissipated over Baffin Island late in the month. Concurrently, the snow in the Central Arctic started melting with a subsequent drop in surface albedo and bottom melt of the ice floes. Our data show that at least in 1979 the advection of a warm moist continental air mass from Central Asia was instrumental in the establishment of the summer regime in the Central Arctic. Throughout the spring and summer of 1979, there were clear sky episodes all over the Arctic Basin lasting enough to significantly affect the surface radiation balance and the dissipation of snow and ice cover. DOE

N84-29396*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE (STS-13) LAUNCH
D. L. Johnson, C. K. Hill, G. Jasper, and G. W. Batts (Computer Sciences Corp.) May 1984 42 p refs
(NASA-TM-82588; NAS 1.15:82588) Avail: NTIS HC A03/MF A01 CSCL 04B

Selected atmospheric conditions observed near Space Shuttle STS-13 launch time on April 6, 1984, at Kennedy Space Center Florida are summarized. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of prelaunch Jimsphere measured vertical wind profiles is given. The final meteorological tape, which consists of wind and thermodynamic parameters versus altitude, for STS-13 vehicle ascent was constructed by Marshall Space Flight Center in response to shuttle task agreement No. 561-81-22-368 with Johnson Space Center. Author

N84-29397*# Washington Univ., Seattle. Geophysics Program.
COSMIC RAYS, SOLAR ACTIVITY, MAGNETIC COUPLING, AND LIGHTNING INCIDENCE
J. T. A. Ely Washington NASA Jul. 1984 17 p refs
(Contracts NAS8-33884; N00014-77-C-0392)
(NASA-CR-3812; NAS 1.26:3812) Avail: NTIS HC A02/MF A01 CSCL 04A

A theoretical model is presented and described that unifies the complex influence of several factors on spatial and temporal variation of lightning incidence. These factors include the cosmic radiation, solar activity, and coupling between geomagnetic and interplanetary (solar wind) magnetic fields. Atmospheric electrical conductivity in the 10 km region was shown to be the crucial parameter altered by these factors. The theory reconciles several large scale studies of lightning incidence previously misinterpreted or considered contradictory. The model predicts additional strong effects on variations in lightning incidence, but only small effects on the morphology and rate of thunderstorm development. Author

N84-29398*# City Coll. Research Foundation, New York.
THEORY AND MODELING OF ATMOSPHERIC TURBULENCE, PART 2 Final Report, 1 Sep. 1982 - 31 Aug. 1983
C. M. Chen Washington NASA Aug. 1984 32 p refs 2 Vol.
(Contract NAS8-34622)
(NASA-CR-3817; NAS 1.26:3817) Avail: NTIS HC A03/MF A01 CSCL 04B

Two dimensional geostrophic turbulence driven by a random force is investigated. Based on the Liouville equation, which simulates the primitive hydrodynamical equations, a group-kinetic theory of turbulence is developed and the kinetic equation of the scaled singlet distribution is derived. The kinetic equation is transformed into an equation of spectral balance in the equilibrium and non-equilibrium states. Comparison is made between the propagators and the Green's functions in the case of the non-asymptotic quasi-linear equation to prove the equivalence of both kinds of approximations used to describe perturbed trajectories of plasma turbulence. The microdynamical state of fluid turbulence is described by a hydrodynamical system and transformed into a master equation analogous to the Vlasov equation for plasma turbulence. The spectral balance for the velocity fluctuations of individual components shows that the scaled pressure strain

correlation and the cascade transfer are two transport functions that play the most important roles. M.A.C.

N84-29399# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
ERROR ANALYSIS FOR WINTERS' ADDITIVE SEASONAL FORECASTING SYSTEM
E. McKenzie Feb. 1984 23 p
(AD-A141355; NPS55-84-005) Avail: NTIS HC A02/MF A01 CSCL 12/1

A procedure for deriving the variance of the forecast error for Winters' Additive Seasonal Forecasting system is given. Both point and cumulative T-step ahead forecasts are dealt with. Closed form expressions are given in the cases when the model is (1) trend-free and (2) non-seasonal. The effects of renormalization of the seasonal factors is also discussed. The fact that the error variance for this system can be infinite is discussed and the relationship of this property with stability of the system indicated. Some recommendations are given about what to do in these circumstances. Author (GRA)

N84-29400# Technion - Israel Inst. of Tech., Haifa. Dept. of Mathematics.
THE STABILITY OF ATMOSPHERIC FIELDS INDUCED BY LOCALIZED TOPOGRAPHY AND HEAT SOURCES Interim Scientific Report, 1 Mar. 1983 - 29 Feb. 1984
L. Merkine 15 Mar. 1984 49 p
(Grant AF-AFOSR-0069-83; AF Proj. 2310)
(AD-A141357; AFOSR-84-0340TR; ISR-1) Avail: NTIS HC A03/MF A01 CSCL 04/2

Zonally asymmetric large scale atmospheric fields can be induced by local forcing effects such as topography and heat sources. The asymmetric effects are particularly strong when the group velocity of the long Rossby waves vanishes. This property was utilized to construct a two-layer model to develop finite amplitude, three dimensional solutions which posses zonally concentrated enhanced shear regions. Such flow fields can become locally unstable, and the energy source for the instability can be baroclinic and/or barotropic. The stability investigation was numerical. Preliminary results are presented. Author

N84-29401# Naval Environmental Prediction Research Facility, Monterey, Calif.
A SPIRAL ANALYSIS TECHNIQUE FOR MONITORING AND PREDICTING TROPICAL CYCLONE INTENSITY USING SATELLITE DATA Final Report
B. J. Cook Feb. 1984 107 p
(AD-A141468; NEPRF-TR-84-01) Avail: NTIS HC A06/MF A01 CSCL 04/2

A spiral analysis technique is developed which quantifies the spiral patterns of cloud bands observed in IR satellite images of tropical cyclones. The technique utilizes the Navy's SPADS (Satellite Data Processing and Display System) minicomputer for processing the digital IR data. The technique consists of best fitting spherical-logarithmic spirals to tropical cyclone spiral cloud bands and performing multiple Fourier analyses of the radiance field along spirals orthogonal to the bands. Linear regression techniques are used to establish a relationship between spiral parameters derived from the Fourier analyses and tropical cyclone intensity. Algorithms for current intensity, and 12 and 24 h forecasts are developed. Tests on an independent data set show significant skill in estimating current intensity and in making 12 h forecasts. The most important predictors selected are presistence and parameters related to the dominant spiral signal and maximum IR count of the analyzed radiance field. Biases in the forecast algorithms suggest that other parameters are necessary to more accurately predict tropical cyclone intensity. The results, however, demonstrate the usefulness of the technique as an aid to tropical cyclone forecasters. GRA

N84-29402# Air Weather Service, Scott AFB, Ill.
MEAN UPPER TROPOSPHERIC FLOW OVER THE GLOBAL TROPICS, VOLUME 2
J. C. Sadler and T. C. Wann Jan. 1984 380 p Original contains color illustrations
(AF Proj. 3276)
(AD-A141484; AD-E850690; AWS/TR-83/002-Vol-2) Avail: NTIS HC A17/MF A01 CSCL 04/2

Upper air climatology over the tropics is a powerful forecast tool. This technical report consists of mean monthly 200 and 300 millibar wind charts for the global tropics. Volume 1 is a brief discussion on how the charts were developed, the significant climatological features, and their use. Volume 2 contains the maps. In day-to-day use the forecaster must identify the location of key synoptic features and adjust the forecast to these features. This requires an understanding of these features, their persistence, and their relative effect on sensible weather. GRA

N84-29403# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A STATISTICAL-DYNAMICAL MODEL FOR FORECASTING COLD AIR STRATOCUMULUS OVER THE YELLOW SEA M.S. Thesis
H. L. Massie, Jr. May 1984 254 p
(AD-A141540; AFIT/CI/NR-84-12T) Avail: NTIS HC A12/MF A01 CSCL 04/2

Satellite pictures from NOAA-6 are used in statistically analyzing cloud amounts from November 1981 through February 1982. Cloud amount (N), defined as the amount of stratocumulus cloud field within the gridded area, is related to stability and relative humidity in the boundary layer. Stability is given by the boundary layer stability parameter, a quantity based on 850 mb height and temperature and the sea surface temperature. The statistical analysis yields regression equations which are used in a stepwise fashion to predict N. These are combined with a Lagrangian model to complete the statistical-dynamical model. The Lagrangian model simulations the modification of continental polar air to maritime polar air. Predictors for the empirical equations are obtained from the numerical simulation. Key variables, such as the 850 mb temperature and relative humidity, were found to agree well with observations. The sensitivity of the simulation to simplifying assumptions is investigated. The model is sensitive to variations in the range of vertical velocity and entrainment rate. GRA

N84-29404# National Severe Storms Lab., Norman, Okla.
INVESTIGATION OF THE DETECTABILITY AND LIFETIME OF GUST FRONTS AND OTHER WEATHER HAZARDS TO AIRCRAFT Final Report, Feb. 1982 - Oct. 1983
D. S. Zrnic and J. T. Lee Washington FAA Oct. 1983 60 p
(Contract DTFA01-81-Y-10521; FAA Proj. 156-410-01W)
(AD-A141552; FAA-PM-83-33) Avail: NTIS HC A04/MF A01 CSCL 04/2

Low-altitude wind shear associated with diverging outflows has been related to several aircraft accidents. We examine several gust fronts using Doppler radar data and measurements from surface stations and tall tower. We present radar-derived parameters such as reflectivity, height, maximum shear, peak velocity, distance of the front from the producing storm and the nearest 30 dBZ contour for several gust fronts within 60 km of the radar during 1980 to 1982. For all orientations of the front, even along the radial direction, the frontal discontinuity was evident in both mean velocity and spectrum width fields. Thus, while detection is practical with a single Doppler radar, accurate estimation of shear magnitudes is more difficult when the frontal discontinuity is aligned along the radial. Several downdrafts of different sizes are present simultaneously behind some of the fronts and the maximum measured shear of radial velocities produced by one downdraft was .02/s. A more typical value of 100/s was observed at several locations. Maximum azimuthal shear of 470/s occurred at the wave crest. GRA

N84-29405# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
METEOROLOGICAL SOUNDING SYSTEMS Final Test Operations Procedure
15 May 1984 39 p Supersedes AD-866629
(AD-A141706; TOP-6-2-185) Avail: NTIS HC A03/MF A01 CSCL 04/2

This test operations procedure (TOP) delineates general test and specific subtest procedures required to measure the technical performance of meteorological Sounding Systems. Comparison of test results with criteria and technical specifications permits evaluation of their suitability for an intended use. The test procedures contained herein apply only to meteorological sounding systems which determine atmospheric pressure, temperature, humidity and upper atmospheric wind speed and direction. Testing of rocket carrier vehicles is not included. GRA

N84-29406# Air Force Systems Command, Patrick AFB, Fla.
METEOROLOGICAL INTERACTIVE DATA DISPLAY SYSTEM (MIDDA) Final Report
J. W. Oliver and J. E. Erickson 24 Feb. 1984 9 p
(AD-A141864; ESMC-TR-84-02) Avail: NTIS HC A02/MF A01 CSCL 04/2

A project has been implemented to fabricate, deliver, and install a Meteorological Interactive Data Display System (MIDDS) at the United States Air Force's (USAF) Cape Canaveral Forecast Facility (CCFF), Cape Canaveral AFS (CCAFS), Florida. The MIDDS system will ingest special mesoscale meteorological data sources; merge them together into a gridded data base composed of a satellite, radar, and conventional meteorological observations; integrate the data into forms where they can be displayed alone or in conjunction with correlative data; and then display the required meteorological information quickly and easily for use by the CCFF forecasters. The MIDDS, a joint NASA and AF project, will significantly improve current capabilities, particularly during Space Shuttle landings where improved 0-3 hour mesoscale forecasts are required. GRA

N84-29407# Naval Environmental Prediction Research Facility, Monterey, Calif.
TROPICAL CYCLONE SEA-STATE PROBABILITY MODEL DEVELOPMENT AND APPLICATION Final Technical Report
J. D. Jarrell, D. Chin, T. Brown, and S. Brand Apr. 1984 74 p (W05-13)
(AD-A142212; NEPRF-TR-84-03) Avail: NTIS HC A04/MF A01 CSCL 04/2

Conditions of sea state around severe storms, especially tropical cyclones, are of major concern to ships. An encounter with a tropical cyclone has the potential for causing structural damage and perhaps even personnel casualties, thus accurate assessment of significant and possibly hazardous sea-state events is highly important. Two models that predict sea state based on operationally available input are examined and compared in this report. While it is concluded that both models provide reasonable forecasts of sea height, a preference for one model over the other is shown. This preferred model is coupled with elements of tropical cyclone wind and strike probability models to create sea state probabilities. These sea state probabilities, when tested on independent data, are found to be in good agreement with observational data. The preferred model developed in the first section of the report then is applied in subsequent sections to form a tropical cyclone threat anlaysis and display aid called TCASS (Tropical Cyclone Applications Software System). The TCASS is designed primarily for shipboard applications and may be used by environmentalists as a briefing aid, for analysis of tropical cyclone threat, and as a tool for formulating a recommended course of action. GRA

N84-29408# East Anglia Univ., Norwich (England). Climatic Research Unit.
SPATIAL PATTERNS OF CLIMATE AND CLIMATIC CHANGE. PART 1: SUMMARY REPORT, APPENDICES 1-5 Progress Report, 1 Apr. 1983 - 27 Feb. 1984
T. M. L. Wigley 27 Feb. 1984 21 p
(Contract DE-AC02-79EV-10098)
(DE84-010253; DOE/EV-10098/T2) Avail: NTIS HC A02/MF A01

Spatial patterns of climatic change over the past 150 years are investigated to obtain insight into possible changes which might occur in a high CO2 warmer world, either using the analogue of scenario approach, or through a better understanding of the processes which cause climatic change on time scales of years to decades. A data base of instrumental climate information is developed from which the characteristics of natural climatic variability can be defined, and these data are analyzed in order to facilitate the early detection of the effects of CO2 induced climatic change. DOE

N84-29409# Oregon State Univ., Corvallis. Wind Resource Assessment Lab.
WIND ENERGY ASSESSMENT STUDIES IN THE GOODNOE HILLS AND CAPE BLANCO AREAS Final Progress Report, Oct. 1981 - Sep. 1982
Robert W. Baker, John E. Wade, and P. Ola G. Persson Nov. 1983 146 p refs
(Contract DE-AC79-80BP-17530)
(DE84-010087; DOE/BP-195) Avail: NTIS HC A07/MF A01

The details of two studies to better define the wind power potential at two potential wind power development areas are given. The sites are located along the southern Oregon coast (Cape Blanco) and in the Columbia River Gorge (Goodnoe Hills/Juniper Point). The variation of wind with height is found as well as the effect of removing trees on the strength and vertical profile of wind in the Cape Blanco area. DOE

N84-29410# Butler Univ., Indianapolis, Ind. Biotic Resource Analysis Program.
ASSESSMENT OF TEMPORAL DYNAMICS OF SELECTED TERRESTRIAL CARBON POOLS Final Report
T. V. Armentano, Orie L. Loucks, E. S. Menges, J. Molofsky, and D. J. Lawler Mar. 1984 208 p refs
(Contract DE-AC02-83ER-60104)
(DE84-009850; DOE/ER-60104/3) Avail: NTIS HC A10/MF A01

Because the annual uptake and release of CO2 by the Earth's biota (50 to 100 Gt/yr) is 10 to 20 times larger than the recent annual combustion of fossil fuel (5 Ft/yr), understanding the global carbon cycle requires detailed consideration of modest alterations in regional photosynthesis or in the oxidation of carbon stored in the major biological pools. An original synthesis of data on wetland carbon sinks and release, and on trends in the use of biological carbon stocks for energy is presented. These results, together with a parallel synthesis of changes in standing forest stocks, indicate that the biosphere has shifted in the past few decades from probably serving as an appreciable sink for CO2 to being neutral with respect to CO2 release or uptake. The trend, however, appears to be in the direction of increased CO2 release. DOE

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N84-29411# Academy of Sciences (USSR), Moscow. Soviet Geophysical Committee.
SEISMOLOGICAL RESEARCH ON THE WORLD OCEAN Results of research on the international geophysical projects
1983 157 p refs In RUSSIAN and ENGLISH
(Rept-9279) Copyright. Avail: Issuing Activity

The Seismologic studies of the ocean floor, the construction of autonomous ocean bottom stations, and various methodologic issues are examined with emphasis on the results of oceanographic seismologic experiments conducted in the Indian and Pacific Oceans using autonomous ocean bottom stations. These research expeditions were conducted to determine the location of seismic zones and to study the regularities of formation and the distribution of hydroacoustic vibrations accompanying ocean bottom station earthquakes. Methods for calculating wave velocity during earthquakes are elaborated. For individual titles, see N84-29412 through N84-29423.

N84-29412# Academy of Sciences (USSR), Moscow.
THE SEISMOLOGICAL INVESTIGATIONS OF THE WORLD

OCEAN: THE STATE OF THE PROBLEM c46
S. A. Boldyrev *In its* Seismological Res. on the World Ocean 1983 p 8-33 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

The results of investigations of tectonic processes and properties of the Earth's crust and mantle below the ocean surface are discussed, based on a review of the Soviet and foreign literature. Oceanic seismologic studies conducted during the past decade centered on seismoacoustic noises in the ocean, the seismicity of oceanic structures, and velocity characteristics of waves from close and distant oceanic earthquakes. The focus of research on surface seismologic phenomena has been the basic epicentral zones connected with both known geomorphologic and tectonic structures and hypothetical formations. Areas of high seismic activity along the shores of the U.S.S.R., United States, and Japan have received the greatest attention. Methodologic problems posed by ocean bottom seismography are discussed, and recommendations for future studies are provided. B.G.

N84-29413# Academy of Sciences (USSR), Moscow.
OCEAN BOTTOM SEISMIC EQUIPMENT
S. M. Zverev, A. N. Fursov, and S. S. Khalilulov *In its* Seismological Res. on the World Ocean 1983 p 34-50 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

Different types of autonomous ocean bottom stations are examined based on Soviet and foreign reports. Ocean bottom stations are used to record microseisms, earth tremors, and seismic waves produced artificially for the purpose of studying the structure of a sedimentary mass, the Earth's crust, and deeper parts of the lithosphere. The technical parameters and construction of ocean bottom stations vary depending on the specific purposes of different units. Electrodynamic seismic detectors and hydrophones are employed to register shifts in ocean bottom stations. Devices allowing preliminary analysis and selection of information are preferred for measurement of waves produced by earthquakes. Cassette recorders aid in the analysis of ocean bottom seismographic data. Cylindrical and spherical containers are constructed from steel, titanium, glass, or aluminum alloys for use in ocean bottom stations. Three part seismometers with various types of orientation and fixation systems are widely used. B.G.

N84-29414# Academy of Sciences (USSR), Moscow.
THE SYSTEM OF TIME SERVICE FOR OCEAN BOTTOM SEISMIC OBSERVATIONS
V. N. Mishatkin *In its* Seismological Res. on the World Ocean 1983 p 51-56 In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

A system of time service for ocean bottom seismic observations is described that fulfills the requirements of maximum simplicity, compactness, and economy of structural components. The system proposed to register time at ocean bottom seismic stations consists of quartz-crystal clocks, a radio to receive precise time signals, an automatic recording instrument, and an installation and control unit. The apparatus is mounted on a ship. The system also utilizes the time markers with which ocean bottom seismic stations are equipped. This system was tested on ocean bottom seismic observations made on the maiden run of the hydrographic ship Georgiy Maksimov. The time markers used proved to be simpler than those employed in earlier tests, and the amount of time and manpower wasted was reduced considerably. B.G.

N84-29415# Academy of Sciences (USSR), Moscow.
OCEAN BOTTOM SEISMOGRAPH OPERATION: CERTAIN PROBLEMS OF PROCEDURE
V. D. Feofilaktov *In its* Seismological Res. on the World Ocean 1983 p 57-64 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

A procedure is described for determining the parameters of geophones applicable in ocean bottom seismographs. These parameters are computed by means of experimental frequency response approximation. The procedure under consideration was elaborated for geophones furnished with one coil transducer.
Author

N84-29416# Academy of Sciences (USSR), Moscow.
SEISMOLOGICAL INVESTIGATIONS IN THE INDIAN OCEAN BY AUTONOMOUS OBS
S. A. Boldyrev and I. F. Kadykov *In its* Seismological Res. on the World Ocean 1983 p 65-81 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

The results of seismologic studies in the Indian Ocean involving the use of autonomous ocean bottom stations are discussed. The studies were conducted during the first run of the hydrographic ship Georgiy Maksimov during the years 1978 and 1979. Geophysical data characterizing the separate tectonic structures of the Indian Ocean were obtained as part of a larger study of a tectonic heterogeneity of the world's oceans and the nature of the boundary between oceans and continents. Earthquakes were considered a direct indicator of current tectonic activity. Ocean bottom seismographic materials revealed intense seismic activity in the swell of the Sound trench and a total absence of earthquakes in the junction zone of the East Indian and Western Australian submarine ridges. Most of the earthquakes registered were accompanied by hydroacoustic oscillations. Analysis of these oscillations helped to define the kinematic characteristics of various subsections of the transitional zone between the Indian Ocean and the Sound trench. B.G.

N84-29417# Academy of Sciences (USSR), Moscow.
SEISMOLOGICAL OBSERVATIONS DURING THE I AND II SOVIET-AMERICAN EXPEDITIONS FOR TSUNAMI STUDY IN THE OPEN SEA
A. I. Ivaschenko and A. I. Spirin *In its* Seismological Res. on the World Ocean 1983 p 82-86 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

The seismicity of the region was studied on the basis of the ocean bottom seismograph records, the OBS being installed near the conjugation of the Kuril and Japan trenches. The seismic activity on the oceanic slope of the trenches is much higher than that on the continental slope. Negative travel time residuals in respect to the Jeffreys-Bullen tables were observed. Almost thirty percent of all the OBS earthquake records were accompanied by the T-phase. Author

N84-29418# Academy of Sciences (USSR), Moscow.
T-PHASE RECORDING BY OBS NEAR THE CONJUGATION OF THE KURIL AND JAPAN TRENCHES c46
A. I. Ivaschenko, F. D. Zhuk, A. I. Spirin, R. R. Harvey, and S. L. Poole *In its* Seismological Res. on the World Ocean 1983 p 87-93 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

Peculiarities of the T-phase recording by OBS, which was installed on the oceanic slope at the conjugation of the Kuril and Japan trenches at the depth of 5500 m are considered. It is noticed that the efficiency of the T-phase generation for the Japanese earthquakes in higher than that for the Kuril earthquakes. The T-phase is generated by the earthquakes with any depth of focus universally under the continental slope of the trenches and even with epicenters located on land. The T-phase generation region is close to the epicenter area. Author

N84-29419# Academy of Sciences (USSR), Moscow.
DOMINANT DEPTH OF SOURCES IN THE KURIL-KAMCHATKA EARTHQUAKE FOCAL ZONE FROM OBSERVATIONS BY SURFACE AND BOTTOM STATIONS c46
S. A. Boldyrev *In its* Seismological Res. on the World Ocean 1983 p 94-103 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

The dominant depth of sources in the Kuril-Kamchatka earthquake focal zone was investigated based on observations made using autonomous surface and ocean bottom stations. The Kuril-Kamchatka seismic focal zone is the primary geotectonic element in the transitional zone from the Asiatic continent to the Pacific Ocean in the Soviet Far East. The parameters of the sources of Kuril-Kamchatka earthquakes constitute the basis for the quantitative evaluation of the dynamics of the region's tectonic processes. Differences in arrival times of longitudinal and transversal waves at stations located on the eastern coast of the Kuril-Kamchatka Island arc were recorded. Analysis of the obtained data indicates that 80 percent of moderate local earthquakes in the transitional zone from Asia to the Pacific Ocean take place in the narrow subcrustal layer of the focal zone. The frequency of earthquakes in this layer and the frequent absorption of resilient waves here, reflecting the rheologic properties of the area, attest to the heightened viscosity of the Kuril-Kamchatka earthquake focal zone. Transl. by B.G.

N84-29420# Academy of Sciences (USSR), Moscow.
THE SEISMICITY OF THE CONTINENTAL SLOPE OF THE KURIL TRENCH FROM THE OBS OBSERVATIONS c46
A. I. Ivaschenko, C. U. Kim, F. D. Zhuk, and A. A. Lukashev *In its* Seismological Res. on the World Ocean 1983 p 104-116 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

From the OBS (Ocean Bottom Seismographs) observations during the Kuril Island seismic experiment, made in the period from October 25 to December 10, 1966, combined with the data of inland seismic network of the USSR and Japan, the source parameters for 250 South Kuril earthquakes were redetermined. The energy-frequency relation and the epicenters map, compiled after DSS observation data were compared with the geological structures of the continental slope of Kuril trench. Author

N84-29421# Academy of Sciences (USSR), Moscow.
ON THE ELASTIC WAVE VELOCITY DISTRIBUTION BENEATH THE CONTINENTAL SLOPE OF THE KURIL TRENCH c46
A. I. Ivaschenko, C. U. Kim, and A. O. Bobkov *In its* Seismological Res. on the World Ocean 1983 p 117-126 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

On the basis of the OBS (Ocean Bottom Seismographs) observation data and the relative residuals technique, the upper mantle velocity model beneath the Western Pacific near the Kuril Islands was specified. Sharp lateral variations of the body wave velocities were found to correlate with bottom topography and tectonics as well as with the lateral variations of seismic activity. Author

N84-29422# Academy of Sciences (USSR), Moscow.
SEISMICITY OF THE NORTH-EASTERN SAKHALIN SHELF c46
L. C. Oskorbin *In its* Seismological Res. on the World Ocean 1983 p 127-133 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

The main features of the earthquake source distribution in relation to geological structure were determined in the first approximation by using instrumental observation data on the North-Eastern Sakhalin earthquakes for the years 1931 to 1979. Some fault plane solutions as well as seismic activity and maximally possible earthquake energy maps are given. The outlook for the study of weak shelf earthquakes with the aid of high sensitive ocean bottom stations was estimated. Author

N84-29423# Academy of Sciences (USSR), Moscow.
SEISMICITY OF ICELAND AND THE ADJOINING REGION OF THE ATLANTIC OCEAN c46
S. A. Boldyrev *In its* Seismological Res. on the World Ocean 1983 p 134-149 refs In RUSSIAN; ENGLISH summary (For primary document see N84-29411 19-48)
Avail: Issuing Activity

The seismic characteristics, current tectonic processes, and kinematic traits of Iceland and the adjoining region of the Atlantic Ocean were discussed, based on observations of large earthquakes in the area recorded by the world system of surface and ocean bottom stations between 1955 and 1980. The earthquakes occurring around Iceland and in the contiguous marine areas form a characteristic field of epicenters consisting of several groups. The greatest density of epicenters was recorded at the junction of the ocean groove and neovolcanic zone of Iceland, frequently called the surface rifting zone. In the Icelandic region as in the entire North Atlantic, basic stresses occur on a generally horizontal plane. Seismic activity is extremely varied around Iceland and in adjacent marine areas. This activity is dependent not only on the specific geologic and seismotectonic processes characteristic of Iceland, but also on the global processes occurring in the lithosphere of the mid-Atlantic zone. A geologico-geophysical map of Iceland and the contiguous marine areas is provided. Transl. by B.G.

N84-29424# Naval Postgraduate School, Monterey, Calif.
HYDROGRAPHIC DATA FROM THE OPTOMA (OCEAN PREDICTION THROUGH OBSERVATIONS, MODELING AND ANALYSIS) PROGRAM OPTOMA2, LEGS I AND II, 31 JULY - 14 AUGUST, 1982 Report, Oct. 1982 - Mar. 1984
M. M. Rienecker, C. N. K. Mooers, M. C. Colton, and P. A. Wittman Mar. 1984 72 p
(AD-A141547; NPS68-84-002) Avail: NTIS HC A04/MF A01 CSCL 08/10

The OPTOMA (Ocean Prediction Through Observations, Modeling and Analysis) Program, a joint NPS/Harvard program sponsored by ONR, seeks to understand the mesoscale (fronts, eddies, and jets) variability and dynamics of the California Current System and to determine the scientific limits to practical mesoscale ocean forecasting. To help carry out the aims of this project, a series of cruises has been planned in two subdomains, NOCAL and CENCAL. The cruise OPTOMA2 was undertaken, in the R/V ACANIA, for two weeks in August, 1982 and covered part of the NOCAL domain which is roughly 200 km square centered 150 km off the California coast. Hydrographic data were acquired during two legs: Leg 1 was carried out during the period 31 July to 5 August and sampled an area 130 km cross-shore by 190 km alongshore with additional transects to and from the domain. Leg 2 was carried out during the period 8 to 14 August and sampled an area roughly 150 km cross-shore by 100 km alongshore. Each leg consisted of a series of parallel transects directed alongshore, separated by roughly 45 km and along which hydrographic stations were occupied every 8.8 km. In addition, there were diagonal transects and tracks to and from the domain. GRA

N84-29425# Naval Postgraduate School, Monterey, Calif.
HYDROGRAPHIC DATA FROM THE OPTOMA (OCEAN PREDICTION THROUGH OBSERVATIONS, MODELING AND ANALYSIS) PROGRAM: OPTOMA1, 8 TO 13 MARCH 1982 Progress Report, Oct. 1982 - Apr. 1984
M. M. Rienecker, C. N. K. Mooers, M. C. Colton, and P. A. Wittman Apr. 1984 36 p
(AD-A141666; NPS68-84-005) Avail: NTIS HC A03/MF A01 CSCL 08/10

The OPTOMA (Ocean Prediction Through Observations, Modeling and Analysis) Program, a joint NPS/Harvard program sponsored by ONR, seeks to understand the mesoscale (fronts, eddies, jets) variability and dynamics of the California Current System and to determine the scientific limits to practical mesoscale ocean forecasting. To help carry out the aims of this project, a series of cruises has been planned in two subdomains, NOCAL and CENCAL. The cruise OPTOMA1 was undertaken, on the R/V ACANIA, in March, 1982 and covered part of the NOCAL domain which is roughly 200 km square centered 150 km off the California coast. From March 8 to 13, hydrographic data were acquired along a series of tracks. In the rectangular domain, roughly 90 km across-shore by 120 km alongshore, the series of parallel transects directed alonshore were separated by about 18 km. Along-track

station spacing was about 8.8 km. In addition, there were tracks to and from the domain. GRA

N84-29426# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
GEOSAT OCEAN APPLICATIONS PROGRAM (GOAP) INITIAL DATA PROCESSING AND ANALYSIS SYSTEM TEST AND EVALUATION PLAN Final Report
M. Lybanon Apr. 1984 33 p
(AD-A141673; NORDA-TN-270) Avail: NTIS HC A03/MF A01 CSCL 08/3

NORDA's Remote Sensing Branch will conduct an operational demonstration as part of the GEOSAT Ocean Applications Program (GOAP). The purpose of the demonstration is to evaluate the extent to which oceanographic products can be derived from altimeter data in near real-time. This technical note describes the information processing system that will be used for this task, and plans for its development and testing. It also covers plans for the operation of the system, personnel assignments and training, evaluation of the products, and eventual transfer of the operations to FNOC or NAVOCEANO. GRA

N84-29427# Yale Univ., New Haven, Conn. Dept. of Computer Science.
A STABLE EXPLICIT SCHEME FOR THE OCEAN ACOUSTIC WAVE EQUATION
T. F. Chan, L. Shen, and D. Lee 1984 17 p
(Contracts N00014-82-K-0184; DAAG29-83-K-0177; DE-AC02-81ER-10996)
(AD-A141800; YALEU/DC/TR-315) Avail: NTIS HC A02/MF A01 CSCL 12/1

A class of ocean acoustic wave propagation problems is represented by a parabolic equation of the Schrodinger type. Using conventional explicit finite difference schemes, e.g., the Euler scheme, to solve the parabolic wave equation is unstable. Thus, important advantages of explicit scheme is then applied to solve the ocean acoustic parabolic wave equation fully utilizing the advantage of explicit schemes. The theoretical development, the computational aspects, and the advantages are discussed. Application of the scheme to a realistic ocean acoustic problem is included. The solution obtained is compared with the unconditionally stable Crank-Nicolson solution. Author (GRA)

N84-29428# Naval Postgraduate School, Monterey, Calif.
THE SPACE-TIME SCALES OF VARIABILITY IN OCEANIC THERMAL STRUCTURE OFF THE CENTRAL CALIFORNIA COAST Ph.D. Thesis
L. C. Breaker Dec. 1983 484 p
(RR0-0001)
(AD-A142040; NPS68-84-001) Avail: NTIS HC A21/MF A01 CSCL 08/10

In the active coastal upwelling regime off Pt. Sur, there was an equatorward surface jet 15 to 40 km offshore, and a weaker poleward undercurrent near the continental slope. Based on tendency analyses of a set of quasi-synoptic hydrographic surveys, both upwelling and mixing were important in lowering sea-surface temperature (SST). The coastal bathymetry influenced the in situ property distributions around Pt. Sur, and the satellite-derived SST patterns. Based on the satellite data, the upwelling frontal boundary meandered with space and time scales of about 80 km (alongshore) and 30 to 40 days, respectively. Over several months, the major upwelling frontal boundary gradually moves the order of 50 km offshore. The major abrupt decreases in coastal SST (of order 3C) in certain years were attributed to the spring transition to coastal upwelling. The four El Nino episodes of the past 12 years were evident in coastal SST. El Nino events may initiate, and apparently strengthen, the spring transitions. Based on daily surface and subsurface temperature, correlation time scales ranged from several days (subsurface) to almost ten days (surface). GRA

N84-29429# JAYCOR, Alexandria, Va. Information Systems Div.
ELLIPTIC SOLVERS FOR MEDITERRANEAN SEA OCEAN MODELING
A. J. Wallcraft May 1984 13 p
(Contract N00014-83-C-0681)
(AD-A142306; AD-E750179) Avail: NTIS HC A02/MF A01 CSCL 08/3

Versions of two beta-plane ocean models suitable for use in the Mediterranean have been prepared. One has two-layers and topography, and the other is a reduced gravity one active layer model. They use both the direct and the preconditioned capacitance matrix techniques (DCMT and PCMT) for solving the constituent non-rectangular two-dimensional finite difference Helmholtz equations with Heumann boundary conditions. Because the ocean models use the primitive equations there are no special problems associated with the modeling of regions with islands, as there would be, for example, in a model using the vorticity stream-function formulation. DCMT is generally faster but requires more memory than the preconditioned method, but PCMT is particularly suited to problems with large Helmholtz coefficients. Therefore the ocean models have been set up to use DCMT only for the external gravity wave mode, all other modes being solved by the PCMT to save storage (these modes have a very large Helmholtz coefficient). Appendix 1 contains listing of the subroutine that interfaces the ocean models and the Helmholtz solvers. GRA

N84-29430# Institute of Oceanographic Sciences, Wormley (England).
PRELIMINARY STUDIES OF THE TOTAL CATION EXCHANGE CAPACITY OF SEDIMENTS FROM TWO NORTH ATLANTIC STUDY SITES
D. J. Hydes, N. C. Hill, H. Clarke, and M. S. N. Carpenter 1983 44 p refs Sponsored by United Kingdom Department of the Environment
(IOS-158; DOE/RW-83/162) Avail: NTIS HC A03/MF A01

Methods of measuring total cation exchange capacity were compared: ammonium saturation with displacement into seawater; barium saturation followed by replacement with magnesium; and sodium-22 and caesium-134 saturation. The barium-magnesium and sodium-22 methods were applied to pelagic clay and carbonate ooze samples. The total cation exchange capacities (TCEC) of samples from the sites are similar when measured by the sodium-22 method. However, for ooze the barium-magnesium method gives a much higher mean. The difference in TCEC measured by the two methods is due to the high calcite content of ooze sediment. Measured exchange capacities are lower than in coastal sediments. In deep sea sediments organic matter either makes a very small contribution to the TCEC or blocks exchange sites. Amorphous oxides of iron and manganese contribute between 20% and 50% of the TCEC. Author (ESA)

N84-29431# Institute of Oceanographic Sciences, Taunton (England).
SEDIMENTATION STUDIES RELEVANT TO LOW-LEVEL RADIOACTIVE EFFLUENT DISPERSAL IN THE IRISH SEA. PART 3: AN EVALUATION OF POSSIBLE MECHANISMS FOR THE INCORPORATION OF RADIONUCLIDES INTO MARINE SEDIMENTS
R. Kirby, W. R. Parker, R. J. Pentreath, and M. B. Lovett 1983 68 p refs
(Contract DGR/481/203)
(IOS-178; DoE/RW-83/134) Avail: NTIS HC A04/MF A01

The sedimentary regime of an area of the Irish Sea near a nuclear plant was studied. Three principal types of radionuclide profiles, interpreted to indicate progressively more efficient bioturbation occur. Burrowing animals may also supply uncontaminated sediment to the bed, where it absorbs radionuclides before, in part, being redeposited locally. This implies that no large external sediment source is necessary to explain the radionuclide profiles encountered. The area is interpreted as a relatively stable sedimentary regime dominated by biological processes.
Author (ESA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N84-29432*# Hampton Inst., Va.
A RADIATIVE TRANSFER MODEL FOR REMOTE SENSING OF LASER INDUCED FLUORESCENCE OF PHYTOPLANKTON IN NON-HOMOGENEOUS TURBID WATER Final Technical Report
D. D. Venable 1983 87 p refs
(Contract NCC1-11)
(NASA-CR-173777; NAS 1.26:173777) Avail: NTIS HC A05/MF A01 CSCL 06A

A semi-analytic Monte Carlo simulation methodology (SALMON) was discussed. This simulation technique is particularly well suited for addressing fundamental radiative transfer problems in oceanographic LIDAR (optical radar), and also provides a framework for investigating the effects of environmental factors on LIDAR system performance. The simulation model was extended for airborne laser fluorosensors to allow for inhomogeneities in the vertical distribution of constituents in clear sea water. Results of the simulations for linearly varying step concentrations of chlorophyll are presented. The SALMON technique was also employed to determine how the LIDAR signals from an inhomogeneous media differ from those from homogeneous media. R.S.F.

N84-29433*# State Univ. of New York, Binghamton.
BIOCIDAL QUATERNARY AMMONIUM RESIN Final Report
Gilbert E. Janauer Nov. 1983 33 p refs
(Contract NAS9-16604)
(NASA-CR-171802; NAS 1.26:171802) Avail: NTIS HC A03/MF A01 CSCL 06A

Activated carbon (charcoal) and polymeric resin sorbents are widely used in the filtration and treatment of drinking water, mainly to remove dissolved organic and inorganic impurities and to improve the taste. Earlier hopes that activated carbon might 'disinfect' water proved to be unfounded. The feasibility of protecting against microbial infestation in charcoal and resin beds such as those to be incorporated into total water reuse systems in spacecraft was investigated. The biocidal effect of IPCD (insoluable polymeric contact disinfectants) in combination with a representative charcoal was assessed. The ion exchange resins (IPCD) were shown to adequately protect charcoal and ion exchange beds. R.S.F.

N84-29434# Washington Univ. Hospital, Seattle. Bioelectromagnetics Research Lab.
EFFECTS OF LONG-TERM LOW-LEVEL RADIOFREQUENCY RADIATION EXPOSURE ON RATS. VOLUME 6: HEMATOLOGICAL, SERUM CHEMISTRY, THYROXINE, AND PROTEIN ELECTROPHORESIS EVALUATIONS Final Report, 1 Jun. 1980 - 31 Mar. 1983
L. L. Kunz, R. B. Johnson, D. Thompson, J. Crowley, and C. K. Chou Mar. 1984 106 p
(Contract F33615-80-C-0612; AF Proj. 7757)
(AD-A141124; USAFSAM-TR-84-2) Avail: NTIS HC A06/MF A01 CSCL 06/18

The blood parameters were evaluated for rats exposed to 2450-MHz 480-microwatts/sq cm (10-microsecond pulse, 800 pps, 8-Hz modulation) in circularly polarized waveguides for 21 hours a day for 25 months. The results of the hematology, serum chemistry, protein electrophoresis, and thyroxine evaluations show no significant points in time or on expected age-related baseline value changes. GRA

N84-29435# Science and Education Administration, Gainesville, Fla. Insects Affecting Man Animals Research Lab.
EVALUATION OF INSECTICIDES, REPELLENTS, AND OTHER APPROACHES TO THE CONTROL OF COASTAL STAND FLIES, CULICOIDES SPP Final Report
D. L. Kline 1 May 1984 29 p
(Contract N00014-79-F-0070)
(AD-A141132) Avail: NTIS HC A03/MF A01 CSCL 06/6

Population dynamics and control studies on Culicoides biting midges were conducted at Parris Island, South Carolina, and Yankeetown, Florida, from September 15, 1979, through September 30, 1983. Population dynamics included studies on species composition, seasonal incidence, and relative abundance of adult Culicoides, and spatial and temporal patterns of larval abundance. Three species at each study site were abundant enough to be considered major pests: Culicoides furens, C. hollensis and C. melleus at Parris Island; and C. barbosai, C. furens and C. mississippiensis at Yankeetown. Culicoides furens is the dominant species from late spring through early fall. Culicoides hollensis and C. mississippiensis are predominant in the spring and fall. Plant cover was a good indicator of larval spatial and temporal distribution. Remote sensing techniques were evaluated and found useful for identification of major marsh plant types both qualitatively and quantitatively. In the laboratory, C. mississippiensis was successfully reared at 20 deg C from eggs obtained from wild-caught blood-fed females. Reared females were 100% autogenous. Insecticidal control studies included laboratory evaluations of adulticides and larvicides, residual applications of insecticides on treated screens, and ground and aerial ULV applications. These laboratory evaluations identified several promising aerosol adulticides (e.g., resmethrin, malathion, naled), larvicides (chlorpyrifos, temephos) and window screen treatments (permethrin, NRDC-161, propoxur). GRA

N84-29436# Desmatics, Inc., State College, Pa.
COMPARISON OF RHESUS MONKEY AND BABOON -G SUB x ACCELERATION EXPERIMENTS
K. C. Burns May 1984 19 p
(Contract N00014-79-C-0128)
(AD-A141395; TR-112-16) Avail: NTIS HC A02/MF A01 CSCL 06/19

NBDL -Gx acceleration rhesus experiments are compared to the results of Clarke et al., with baboons using the Air Force shoulder harness-lap belt restraint. Baboons are shown to have significantly less tolerance to -Gx acceleration. The differential effect of peak sled acceleration is shown to be the same for each species. The statistical models used are logistics response functions of peak sled acceleration and the initial yaw angle of the head. GRA

N84-29437# Arizona Univ., Tucson. Coll. of Business and Public Administration.
INFORMATION SEARCH IN JUDGMENT TASKS: THE EFFECTS OF UNEQUAL CUE VALIDITY AND COST Interim Technical Report
T. Connolly and P. Serre May 1984 31 p
(Contract N00014-83-K-0742)
(AD-A141712; ONR-84-1) Avail: NTIS HC A03/MF A01 CSCL 05/1

The broad question addressed by this research is: How good are humans at balancing the costs and benefits of their information acquisition? Do they buy those, and only those, sources of information whose acquisition cost is outweighed by the improvement in decision quality that their use makes possible? The evidence reported here, together with that reviewed earlier, suggests that the answer is not encouraging. Specifically, the present findings extend those noted earlier in suggesting: (1) That the pattern of overpurchase for low-consequence decisions, and underpurchase for high-consequence decisions, is robust to variation in overall cue validity, as well as to procedural modifications such as manual versus computer-interactive transactions (Experiment 1), (2) That overpurchase is frequently coupled with mispurchase (Experiments 2 & 3). That is, subjects, in addition to buying overall more information than was normatively justified, frequently bought expensive cues when cheap, equally-valid ones were available (Experiment 2), or low-validity cues when higher-validity, equally-costly cues were available (Experiment 3), (3) That subjects perceive equally-valid cues as of differential validity (Experiments 1 & 2), and are able to detect real validity differences between cues reliably only when the differences are large (Experiment 3). Purchase behavior is generally shaped by these perceptions of validity, whether well-founded or not, though the

relationship disappears when equally-valid cues are offered at different costs (Experiment 2). GRA

N84-29438# New York State Dept. of Health, Albany. Center for Labs. and Research.
METHANE PRODUCING BACTERIA: IMMUNOLOGICAL CHARACTERIZATION Final Report, 1 Apr. 1981 - 31 Mar. 1984
E. C. deMacario, A. J. L. Macario, and M. J. Wolin Mar. 1984 16 p refs
(Contract DE-AC02-81ER-10880)
Avail: NTIS HC A02/MF A01

Methanogenic bacteria, or methanogens, were studied systematically with immunologic techniques. A comprehensive bank of reference antisera was organized from which calibrated antibody probes were generated of high resolution power for rapid bacterial identification and classification, and for examining samples from complex ecosystems. A method was standardized for antigenic fingerprinting methanogens. It was found that these bacteria form an immunologically coherent group, with subgroups of antigenically related members. Antigenic relationships paralleled the phylogenetic organization delineated by comparisons of 165 rRNA nucleotide sequences, and by cell wall chemistry. Immunologic data emerged as one of the three basic tenets of the notion that methanogens belong in a third primary kingdom, the archaebacteria, evolutionarily different from eubacteria and eukaryotes. The finding, methods and antibodies produced were useful monitoring the bacterial flora of bioreactors. Direct examination of specimens is now possible by simple and specific immunologic procedures, in a few hours. E.A.K.

N84-29439# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
AN OPTIMAL CONTROL PROBLEM IN THE STUDY OF LIVER KINETICS
Kjell Holmaaker 1984 20 p refs Submitted for publication
(CTH-Math-1984-10; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

For a substance in the blood transformed twice by different kinds of enzymes, the distribution of the enzymes along the blood flow so that the outflow concentration of the once-transformed form of the substance is as small as possible is considered. The problem is solved for general types of kinetics (including substrate-inhibition kinetics). The problem is considered as an optimal control problem, and Pontryagin's maximum principle is applied to derive necessary conditions. Author (ESA)

N84-28865# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND MEDICINE: YESTERDAY AND TODAY
O. G. Gazenko *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 86-93 Transl. into ENGLISH from Zemlya Vselennaya (USSR), no. 5, Sep.-Oct. 1983 p 4-8 Original language document announced as A84-32369 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28866# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF EQUIPMENT FOR 'COSMOS-1514' BIOSATELLITE
T. Chesanova *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 94-97 Transl. into ENGLISH from Leningr. Pravda (USSR), 23 Dec. 1983 p 4 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28868# Joint Publications Research Service, Arlington, Va.
INVESTIGATING SPATIAL DISTRIBUTION OF PHYTOPLANKTON IN LAKE BAYKAL BY OPTICAL METHODS Abstract Only
F. Y. Sidko, P. P. Sherstyankin, A. D. Aponasenko, L. A. Shur, N. A. Frank, and A. F. Sidko *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 101 Transl. into ENGLISH from Issled. Zemli Kosmosa (USSR), no. 5, Sep.-Oct. 1983 p 11-14 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N84-29440* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 260)
Jul. 1984 75 p
(NASA-SP-7011(260); NAS 1.21:7011(260)) Avail: NTIS HC $7.00 CSCL 06E

A bibliography containing 225 reports, articles, and other documents which were introduced into the NASA Scientific and Technical Information system in June 1984 is presented. All articles are indexed and abstracted. General topics include: life sciences, aerospace medicine, behavioral sciences, man/system technology and life support, and planetary biology. R.S.F.

N84-29441# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technol.
USE OF THE DOPPLER ULTRASOUND METHOD TO EVALUATE THE RATE OF BLOOD FLOW IN CHILDREN WITH PATENT DUCTUS ARTERIOSUS [ZASTOSOWANIE ULTRADZWIEKOWEJ METODY DOPPLEROWSKIEJ DO OCENY PREDKOSCI PRZEPLYWU KRWI U DZIECI Z PRZECIEKIEM AORTALNO-PLUCNYM]
Krystyna Iwaskiewcz 1982 103 p refs In POLISH
(ISSN-0208-5658) Avail: Issuing Activity

The Doppler ultrasound technique was used to evaluate changes in the rate of blood flow in children with patent ductus arteriosus. A group of healthy control children was used for comparison. Characteristic changes in blood flow through the carotid, humeral, and femoral arteries were established for the affected children. The usual pattern was a three-phase flow during the contraction phase and a decrease in blood flow mainly in the carotid artery. Following corrective surgery, the three-phase flow pattern ceased and there was an increase in mean blood flow through the common carotid artery. The contraction phase also became shorter. Similar changes in the blood flow curve were observed in children with tetralogy of Fallot, in whom the subclavian artery was joined with the pulmonary artery using the Blalock-Taussig method. Doppler ultrasound results were consistent with cardiologic, radiologic, and sphygmo-oscillometric findings and also showed a high level of sensitivity in cases of shunt from the aorta to the pulmonary artery, which improved postsurgical evaluation. It is concluded that the Doppler ultrasound technique is a simple and noninvasive method for diagnosing patent ductus arteriosus. M.G.

N84-29442# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technology.
EXPERIMENTAL AND CLINICAL RESEARCH ON THE EFFECTIVENESS OF ULTRASOUND IN VASCULAR SURGERY [BADANIA DOSWIADCZALNE I KLINICZNE NAD PRZYDATNOSCIA ULTRADZWIEKOW W CHIRURGII NACZNIOWEJ]
Jerzy Wesolowski 1982 212 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

The effectiveness of ultrasound in diagnosing occulsion of the aorta and peripheral arteries, early complications following reconstruction of the peripheral arteries, aneurysms of the aorta and peripheral arteries, and late complications following reconstruction of the abdominal aorta and peripheral arteries was assessed. In experimental studies of the canine aorta, it was shown that the most sensitive method for determining blood flow is to determine the systolic pressure below the aortic stenosis. A clinical study comparing 180 extremities from 140 patients with ischemia of the lower limbs with 40 extremities from 20 healthy control subjects

was conducted. The presence of a pressure gradient below or above the knee indicated an occulsion of the femoral or popliteal artery. Ultrasonic studies of 72 patients with clinically suspected or confirmed aneurysms of the abdominal aorta and peripheral arteries permitted correct diagnosis in 92% of cases without recourse to aortic arteriography. The findings suggest that ultrasonic tests can replace arteriography in the diagnosis and postoperative management of aneurysms of the abdominal aorta and peripheral arteries. Author

N84-29443# Rochester Univ., N. Y. School of Medicine and Dentistry.

MICROWAVES AND HUMAN LEUKOCYTE FUNCTION: EXPOSURE OF HUMAN MONONUCLEAR LEUKOCYTES TO MICROWAVE ENERGY PULSE-MODULATED AT 16 Hz OR AT 60 Hz Final Report, 1 Feb. 1983 - 1 Feb. 1984

Norbert J. Jr. Roberts, Sol M. Michaelson, and Shin-Tsu T. Lu Apr. 1984 15 p

(Contract F33615-83-K-0609; AF Proj. 7757)

(AD-A141071; USAFSAM-TR-84-9) Avail: NTIS HC A02/MF A01 CSCL 06/18

Human mononuclear leukocytes were exposed to 2450 MHz microwaves pulse-modulated at 16 Hz or at 60 Hz, at specific absorption rates up to 4 mW/ml. Such exposures produced no detectable effects on leukocyte viability, or on unstimulated or mitogen-stimulated DNA synthesis or total protein synthesis. The data provided no evidence that exposure to pulse-modulated microwaves in more likely to alter human leukocyte function than is exposure to continuous waves at equivalent energy levels. GRA

N84-29444# Army Research Inst. of Environmental Medicine, Natick, Mass.

MAXIMAL POWER OUTPUTS DURING THE WINGATE ANAEROBIC TEST

J. F. Patton, M. M. Murphy, and F. A. Frederick 3 May 1984 18 p

(AD-A141374; USARIEM-M-23/84) Avail: NTIS HC A02/MF A01 CSCL 06/19

The purpose of this study was to determine the resistance settings which elicit maximal values of power output (PO) values during performance of the Wingate Test (WT). Nineteen male subjects performed multiple WT in a random order at resistance settings ranging from 0.055 to 0.115 kg/kg BW. Tests were carried out on a Monark cycle ergometer modified to permit instantaneous application of resistance. Revolutions were determined by a computer interfaced frequency counter. The mean resistance settings eliciting the highest peak power (PPO) and mean power (MPO) outputs were 0.096 and 0.094 kg/kg BW, respectively (average setting of 0.095 kg/kg BW). Both PPO and MPO were significantly higher (15.5% and 13.0%, respectively) using a resistance setting of 0.095 compared to the Wingate setting of 0.075 kg/kg BW. The test-retest reliability for PPO and MPO ranged between 0.91 and 0.93 at both resistance settings. Body weight, % body fat and thigh volume did not significantly estimate the individual resistance settings eliciting maximal PO's. The data suggest that resistance be assigned according to the subjects BW but consideration be given to increasing this resistance from that presently used in various laboratories. GRA

N84-29445# Naval Submarine Medical Research Lab., Groton, Conn.

VISUAL CLARITY WITH A BLACK-AND-WHITE SCENE Interim Report

J. A. Worthey 30 Mar. 1984 20 p

(AD-A141498; NSMRL-975) Avail: NTIS HC A02/MF A01 CSCL 05/10

Visual clarity experiments are usually done with colorful test objects, and it is generally concluded that the results of such experiments are related to the color-rendering properties of the illuminants involved. Nonetheless, it has been observed that a clarity difference between illuminants may be seen, even with black-and-white objects. An experiment was performed to measure differences of perceived clarity using only black-and-white fabric and black yarn as test objects. (The word clarity was not used in the instructions to subjects. They were asked questions concerning preference and blackness.) The differences measured seem to indicate a role for color in black-and-white vision, but not a pure clarity effect independent of illuminant color. GRA

N84-29446# New Mexico State Univ., Las Cruces. Behavioral Engineering Lab.

EYE ACCOMMODATION, PERSONALITY, AND AUTONOMIC BALANCE

V. J. Gawron Nov. 1979 96 p

(Grant AF-AFOSR-0024-80; AF Proj. 2313)

(AD-A141499; BEL-79-2/AFOSR-79-6; AFOSR-84-0427TR) Avail: NTIS HC A05/MF A01 CSCL 05/10

The automatic nervous system is made up of two subsystems: the parasympathetic (PNS) and the sympathetic (SNS). The balance between these systems regulates bodily functioning during routine (PNS-dominant) and crisis (SNS-dominant) situations. It also controls visual accommodation for near (PNS-dominant) and far (SNS-dominant) focus. The balance between these physiological systems has been linked to individual differences in personality characteristics, especially introversion (PNS-dominant) and extraversion (SNS-dominant). Since the balance mediates accommodation, the similar personality differences between near- and far-sighted individuals may be related to the more general parasympathetic-sympathetic balance rather than being related solely to the visual capability difference. The relationships among autonomic balance (as measured by a battery of four physiological tests modified from Wenger and Ellington, 1943, and by a technique introduced by Porges, 1976), refractive error (measured by dark focus, near and far points using a polarized vernier optometer), and introversion - extraversion (Eysenck Personality Inventory introversion - extraversion scale core) were investigated. GRA

N84-29447# California Univ., Torrance. Dept. of Psychiatry.

STRESS BIOCHEMISTRY: NON-INVASIVE MEASUREMENT TECHNIQUES IN MILITARY SUBJECTS Final Report, Oct. 1980 - Jun. 1983

Robert T. Rubin and Russell E. Poland 23 Apr. 1984 12 p

(Contract N00014-81-K-0561)

(AD-A141598) Avail: NTIS HC A02/MF A01 CSCL 06/1

The focus of the studies was on the relationship between saliva and plasma steroid hormones, under basal conditions, suppression with dexamethasone, and simulated field conditions of exercise. The results demonstrate a very good correspondence between saliva and serum cortisol, such that saliva cortisol measures can be substituted for blood drawing for cortisol, as a non-invasive means of measuring levels of this stress-related hormone. Under conditions of physical exercise, saliva and serum cortisol levels did not change. Results with testosterone suggest that saliva testosterone also reflects serum testosterone fairly closely, although the relationship is not as good as that for cortisol. Physical exercise did result in an approximately 20% increase in both plasma and saliva testosterone concentrations. Finally, the correlation between saliva and serum melatonin was examined. While melatonin is measurable in saliva, it appears to correlate very poorly with serum melatonin, thus not being a useful reflection of serum melatonin. Work continues on the possibility of measuring a melatonin metabolite in saliva, which might more accurately reflect circulating melatonin levels in serum or plasma. GRA

N84-29448# Army Aeromedical Research Unit, Fort Rucker, Ala.

DEVELOPMENT OF A MICROPROCESSOR BASED AUDIOMETER FOR THRESHOLD SHIFT STUDIES

B. T. Mozo, J. H. Patterson, Jr., R. Marrow, W. R. Nelson, and I. M. Lomba-Gautier Mar. 1984 12 p

(DA Proj. 3E1-62777-A-878)

(AD-A142124; USAARL-84-7) Avail: NTIS HC A02/MF A01 CSCL 06/16

In order to permit the collection of data on hearing threshold shift resulting from firing Army weapons, a multichannel microprocessor-controlled audiometer was developed. The system

features four synchronized channels for determining hearing thresholds by a fixed frequency, fix test-time Von Bekesy tracking method. Nonstandard, noise excluding headsets were developed as part of the system. Biological calibration of the system was accomplished by comparison to a clinical audiometer and a validation test was completed to demonstrate system accuracy and reliability. The results indicate the system is as accurate as, and more reliable than, the clinical audiometer. Author (GRA)

N84-29449# Army Research Inst. of Environmental Medicine, Natick, Mass.

RECOMMENDATIONS FOR THE CONDUCT OF PHYSICAL TRAINING IN COLD WEATHER

W. L. Daniels and J. Dziados 1 Jun. 1984 11 p
(AD-A142137; USARIEM-M-24/84) Avail: NTIS
HC A02/MF A01 CSCL 06/19

These suggestions are meant to be guidelines to the Commander for the safe conduct of physical training during cold weather. This presentation presents guidelines for the conduct of physical training in cold weather. Training guidelines are presented to cover such areas as temperature, humidity, cold and injury prevention. GRA

N84-29450# Kentucky Univ., Lexington. Research Lab.

RESPONSE OF THE CARDIOVASCULAR SYSTEM TO VIBRATION AND COMBINED STRESSES Final Report, 1 Oct. 1982 - 30 Sep. 1983

C. F. Knapp, J. M. Evans, D. C. Randall, J. B. Charles, and B. S. Kelley 30 Nov. 1983 238 p
(Contract F49620-83-K-0002)
(AD-A142166; AFOSR-84-0482TR) Avail: NTIS
HC A11/MF A01 CSCL 06/19

Contents: Heart Rate Responses of Humans to Sinusoidally Varying + or - 1 Gz Gravitational Stress; A new chronically instrumented animal preparation in which heart rate (via AV sequential pacing) can be computer controlled in either an open or closed-looped manner; Cardiovascular Responses of Untrained and Endurance Trained Dogs to Oscillatory Blood Volume Shifts; and Changes in Peak Left Ventricular Wall Stress in Normal and Cardiac Denervated Canines During Sinusoidal Acceleration. GRA

N84-29451# Advanced Research Resources Organization, Bethesda, Md.

VALIDATION OF THE MILITARY ENTRANCE PHYSICAL STRENGTH CAPACITY TEST Technical Progress Report, Jan. 1982 - Jul. 1983

D. C. Myers, D. L. Gebhardt, C. E. Crump, and E. A. Fleishman Jan. 1984 88 p
(Contract MDA903-82-C-0140; DA Proj. 2Q1-62722-A-791)
(AD-A142169; ARRO-R83-10; ARI-TR-610) Avail: NTIS
HC A05/MF A01 CSCL 05/9

A battery of physical ability tests was validated using a predictive, criterion-related strategy. The battery was given to 1,003 female soldiers and 980 male soldiers before they had begun Basic Training. Criterion measures which represented physical competency in Basic Training (i.e., physical proficiency tests, sick call, profiles, and separation data) as well as on the job (i.e., lifting, carrying, pushing, pulling activities) were correlated with the soldiers' scores on the physical ability tests. The job performance measures (i.e., criterion performance tasks) were designed to evaluate proficiency in the performance of tasks determined to be important in physically demanding Army jobs (i.e., Lift, Carry, Push and Torque). The criterion performance tasks were administered to the 951 soldiers who had completed Advanced Individual Training (AIT). The results indicated that test validity was high (R = .84). The Lift 60 accounted for 67% of the variance in criterion performance, while Lean Body Mass (LBM) and the Upright Pull test accounted for an additional 3% and 1%, respectively. The fairness analysis showed that there were non-significant slope differences and only slight intercept differences which suggested minimal overprediction for women. GRA

N84-29452# Army Research Inst. of Environmental Medicine, Natick, Mass.

THE INFLUENCE OF CARDIORESPIRATORY FITNESS ON THE DECREMENT IN MAXIMAL AEROBIC POWER AT HIGH ALTITUDE

A. J. Young, A. Cymerman, and R. L. Burse 11 Jun. 1984 21 p
(DA Proj. 3E1-62777-A-879)
(AD-A142218; USARIEM-M-25/84) Avail: NTIS
HC A02/MF A01 CSCL 06/19

There are conflicting reports in the literature which imply that the decrement in maximal aerobic power experienced by a sea-level (SL) resident sojourning at high altitude (HA) is either smaller or larger for the more aerobically fit person. In the present study, data collected during several investigations conducted at an altitude of 4300 m were analyzed to determine if the level of aerobic fitness influenced the decrement in maximal oxygen uptake (VO2 max) at HA. The VO2 max of 51 male SL residents was measured at an altitude of 50 m and again at 4300 m. GRA

N84-29453# Army Research Inst. of Environmental Medicine, Natick, Mass.

INFLUENCE OF HEAT STRESS AND ACCLIMATION ON MAXIMAL AEROBIC POWER

M. N. Sawka, A. J. Young, B. C. Cadarette, L. Levine, and K. B. Pandolf Jun. 1984 20 p
(DA Proj. 3E1-62777-A-879)
(AD-A142329; USARIEM-M-27/84) Avail: NTIS
HC A02/MF A01 CSCL 06/19

Thirteen male volunteers performed cycle ergometer maximal oxygen uptake (VO2 max) tests in moderate (21 C, 30% rh) and hot (49 C, 20% rh) environments, before and after a nine-day heat acclimation program. This program resulted in significantly decreased ($P<0.01$) final heart rate (24 bt/min) and rectal temperature (0.4 C) from the first to last day of acclimation. The VO2 max was lower ($P<0.01$) in the hot environment relative to the moderate environment both before (8%) and after (7%) acclimation with no significant difference ($P>0.05$) shown for maximal power output (PO max, watts) between environments either before or after acclimation. The VO2 max was higher ($P<0.01$) by 4% after acclimation in both the moderate (4%) and hot (2%) environments. The reduction in VO2 max in the hot compared to moderate environment was not related to the difference in core temperature at VO2 max between moderate and hot trials, nor was it strongly related with aerobic fitness level. These findings indicate that heat stress, per se, reduced the VO2 max. Further, the reduction in VO2 max due to heat was not affected by state of heat acclimation, the degree of elevation in core temperature, or level or aerobic fitness. GRA

N84-29454# Army Research Inst. of Environmental Medicine, Natick, Mass.

UPPER BODY EXERCISE PERFORMANCE: COMPARISON BETWEEN WOMEN AND MEN

J. E. Falkel, M. N. Sawka, L. Levine, N. A. Pimental, and K. B. Pandolf Jun. 1984 26 p
(DA Proj. 3E1-62777-A-879)
(AD-A142330; USARIEM-M-26/84) Avail: NTIS
HC A03/MF A01 CSCL 06/19

This study compared upper body (arm crank) aerobic fitness for a group of women ($n = 8$) and men ($n = 9$) matched for lower body (cycle) aerobic fitness and also examined the influence selected physiological factors had on upper body exercise performance. The components of upper body exercise studied included maximal power output (PO max), peak oxygen uptake (peak VO2), upper body isokinetic strength and endurance, arm volume, and endurance time at 80% arm crank peak VO2. During maximal effort upper body exercise, there was no difference in peak VO2 between the genders despite the men's significantly greater strength, arm volume and PO max. There were no differences in upper body peak VO2 when the gender differences in arm volume were accounted for. Likewise, there was no difference in upper body endurance time at 80% peak VO2 between the genders. These data indicated that: (1) women do not have

an inherent disadvantage to perform upper body exercise; (2) skeletal muscle strength provides a relatively minor influence on both maximal effort and prolonged upper body exercise; (3) individuals can perform prolonged upper body exercise at relative intensities greater than that needed to elicit an aerobic training effect. GRA

N84-29455# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Experimental Psychology Group.
A RE-EVALUATIONS OF CANCELLATION THEORY: VISUAL, VESTIBULAR AND OCULOMOTOR CONTRIBUTIONS TO PERCEIVED OBJECT MOTION
A. H. Wertheim and W. Bles Mar. 1984 58 p refs
(AD-B082936; IZF-1984-8; TDCK-79148) Avail: NTIS HC A04/MF A01

A theoretical framework and experimental paradigm for investigations of perceived object motion are presented. The approach consists of an extended version of cancellation theory, but differs from more traditional versions in that it yields a quantitative measure of a just noticeable difference between signals which carry information about retinal image movement (retinal signals) and signals which carry information about eye and head movements (reference signals); yields a quantitative measure of the precision with which movements of the eyes and head are registered within reference signals; and includes modulation of the reference signals as result of retinal image movements. Author (ESA)

N84-28826# Joint Publications Research Service, Arlington, Va.
MEDICAL RESEARCH PROGRAM OF 'SOYUZ T-10' CREW
In its USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 8-9 Transl. into ENGLISH from Med. Gaz. (USSR), 10 Feb. 1984 p 1 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28827# Joint Publications Research Service, Arlington, Va.
GOALS OF COSMONAUT AT'KOV'S MEDICAL STUDIES ON 'SALYUT-7'
A. Ivakhnov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 10-12 Transl. into ENGLISH from Izvestiya (USSR), 3 Mar. 1984 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28832# Joint Publications Research Service, Arlington, Va.
COMET STUDIES, MEDICAL RESEARCH ON 'SALYUT-7'
A. Pokrovskiy *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 26-27 Transl. into ENGLISH from Pravda (USSR), 27 Feb. 1984 p 8 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-29468*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PHYSIOLOGICAL FUNCTIONING OF THE EAR AND MASKING
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 25-56 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 06P

N84-29472*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NOISE-INDUCED HEARING LOSS AND ITS PREDICTION
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 219-330 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 06P

N84-29473*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NOISE-INDUCED HEARING IMPAIRMENT AND HANDICAP
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 331-342 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 06P

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N84-29456*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
UNIFORM APPARENT CONTRAST NOISE: A PICTURE OF THE NOISE OF THE VISUAL CONTRAST DETECTION SYSTEM
A. J. Ahumada, Jr. and A. B. Watson Jul. 1984 25 p
(NASA-TM-85867; A-9574; NAS 1.15:85867) Avail: NTIS HC A02/MF A01 CSCL 05I

A picture which is a sample of random contrast noise is generated. The noise amplitude spectrum in each region of the picture is inversely proportional to spatial frequency contrast sensitivity for that region, assuming the observer fixates the center of the picture and is the appropriate distance from it. In this case, the picture appears to have approximately the same contrast everywhere. To the extent that contrast detection thresholds are determined by visual system noise, this picture can be regarded as a picture of the noise of that system. There is evidence that, at different eccentricities, contrast sensitivity functions differ only by a magnification factor. The picture was generated by filtering a sample of white noise with a filter whose frequency response is inversely proportional to foveal contrast sensitivity. It was then stretched by a space-varying magnification function. The picture summmarizes a noise linear model of detection and discrimination of contrast signals by referring the model noise to the input picture domain. Author

N84-29457*# Johns Hopkins Univ., Baltimore, Md. Dept. of Psychiatry.
BEHAVIORAL AND BIOLOGICAL EFFECTS OF CHANGES IN GROUP SIZE AND MEMBERSHIP
H. H. Emurian, J. V. Brady, R. L. Ray, J. L. Meyerhoff, and E. H. Mougey 1 Jun. 1984 137 p
(Grant NGR-21-001-111; Contract N00014-80-C-0467)
(NASA-CR-173801; NAS 1.26:173801; AD-A141561; TR-ONR-10)
Avail: NTIS HC A07/MF A01 CSCL 05J

Groups performing complex tasks under operational conditions can be anticipated to undergo changes in size and membership. Accordingly, the present research project developed a paradigm for investigating effects of such membership turbulence with 2-person and 3-person groups residing in a programmed laboratory environment for 10 successive days. A range of mission parameters (e.g., performance tasks, motivation, group render composition, social interaction opportunities, etc.) was systematically explored during 10 studies that included 6 analyses of changes in group size and 4 analyses of changes in group membership. The resulting database provides the opportunity for inductive determinants of interrelationships among performance, behavioral, and endocrine effects that were assessed throughout each of the 10 group investigations. GRA

N84-29458# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
NONLABORATORY TECHNIQUES FOR THE STUDY OF COGNITIVE AND DECISION-MAKING PROCESSES: A DESCRIPTION AND SELECTED BIBLIOGRAPHY
J. Hall and R. H. Phelps Dec. 1983 34 p
(DA Proj. 2Q2-63739-A-793)
(AD-A141732; ARI-RN-83-45) Avail: NTIS HC A03/MF A01 CSCL 05/10

This technical report describes nonlaboratory research methods that can be adapted to examine covert cognitive and decision-making processes underlying the performance of a task. These techniques generally can be applied in the natural task setting with a minimum of interference and disruption of task performance. Summarized are nine methods classified under three main categories: process-tracing methods, applied research methods, and field research methods. In addition to a full description of each method, major references and selected

annotations are included. While most of these methods traditionally have not been used to study cognition, suggestions for their adaptation to cognitive applications are provided. GRA

N84-29459# New Mexico State Univ., Las Cruces. Dept. of Psychology.
COGNITIVE ORGANIZATION AS A FUNCTION OF FLYING EXPERIENCE Final Report
R. W. Schvaneveldt, T. J. Breen, N. M. Cooke, F. T. Durso, T. E. Goldsmith, R. G. Tucker, and J. C. DeMaio Brooks AFB, Tex. AFHRL May 1984 51 p
(Contract F33615-80-C-0004; AF Proj. 2313)
(AD-A141767; AFHRL-TP-83-64) Avail: NTIS HC A04/MF A01 CSCL 05/10

This report reviews work in defining and measuring conceptual structures of critical flight information in Air Force fighter pilots. Groups of pilots with widely varying expertise were tested. Cognitive structures were defined by multidimensional scaling (MDS) and general weighted networks (GWN). The structures were validated by recovering the experience differences among the pilots from their conceptual structures. Group membership can be predicted from a person's conceptual structure. The techniques employed permit detailed analyses of individual differences, and they point to factors distinguishing expert and novice pilots. The GWN analysis led to the identification of specific points of agreement and disagreement in the conceptual organization of novice and expert pilots. Pilots do have measurable cognitive structures for organizing flight-related information. These structures are measurably different for individuals with differing flight experience. The techniques used here produce descriptions of conceptual structure that may have application in training and assessing individual differences in the development of expert conceptual structures. GRA

N84-29460# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
SYMBOLIC KNOWLEDGE PROCESSING FOR THE ACQUISITION OF EXPERT BEHAVIOR: A STUDY IN MEDICINE Interim Technical Report
A. T. Rappaport and J. M. C. Chauvet May 1984 50 p
(AD-A141835; CMU-RI-TR-84-8) Avail: NTIS HC A03/MF A01 CSCL 09/4

This research is concerned with the simulation of learning by experience to induce the capability for a knowledge-based system to pre-structure the problem before solving it. The model we present is made of different consecutive modules accounting for the tasks of problem solving, building a dynamic memory and extracting expectations, and pre-structuring or pre-solving the problem. The problem-solver yields internal representation of the problems between which symbolic distances may be defined. The latter are then processed to build the dynamic memory. We used the formalization of medical problem-solving as an example, studying how successive evaluations of cases may lead to the acquisition of the capability to generate an accurate set of initial hypotheses: an expert behavior. The knowledge base is not modified, neither are the strategies in the present implementation. To the data gathering about the patient's complaints is added a concept-driven process by which the system asks for specific data representative of the past experience. The results show that such a system, evolving in a coherent reality increases its qualitative behavior by initially focusing on the right hypotheses or goals. This improvement is induced by the exposure to new situations. Moreover, situations once or rarely encountered are efficiently recognized when re-occurring later. GRA

N84-29461# Texas A&M Univ., College Station. Dept. of Management.
EFFECTS OF CONFIRMED AND DISCONFIRMED EXPECTATIONS: A NATURALLY OCCURING EXPERIMENT
J. E. Skivington and R. W. Woodman May 1984 42 p
(AD-A141857; TR-ONR-6) Avail: NTIS HC A03/MF A01 CSCL 05/10

The existence of a naturally occurring event (the selection of students for an honors program) permitted a test of cognitive dissonance theory through falsification. Affective reactions to confirmed and disconfirmed expectations were measured using both quantitative and qualitative approaches. Support for dissonance reduction through affective displacement is discovered but the results raise questions about the predictive ability of cognitive dissonance theory. Methodological issues and attributionally based extensions to dissonance theory are discussed. GRA

N84-29462# Illinois Univ., Urbana. Model Based Measurement Lab.
A STATISTICAL PROCEDURE FOR ASSESSING TEST DIMENSIONALITY
W. Stout 9 Mar. 1984 21 p
(Contracts N00014-79-C-0752; N00014-83-K-0397; RR0-4204)
(AD-A142179; MEASUREMENT/SER-84-2) Avail: NTIS HC A02/MF A01 CSCL 05/10

An important problem in psychological test theory is the development of a sound method for determining whether a test which purports to measure the level of a certain ability is, in reality, significantly contaminated by one or more other abilities displayed by persons taking the test. Because of the large number of private and governmental organizations routinely using tests to screen people for the levels of various abilities, this problem of assessing the dimensionality of a test is of great importance. The solution will be useful in settings other than psychological testing, since the problem is one of general interest and should, hence, be an important addition to statistical methodology literature. Described in this paper is an approach to the problem of finding a theoretically sound and useful procedure for making inferences about the dimensionality of the ability parameter, or more precisely, the dimensionality of the distribution of the ability parameter. GRA

N84-29463# Colorado Univ., Boulder. Inst. of Cognitive Science.
MODIFICATION OF CURRENT FEEDBACK STRATEGIES: A TEXT SYNTHESIS APPROACH Final Report
P. Langer and V. Keenan Mar. 1984 58 p
(Grant AF-AFOSR-0149-83)
(AD-A142187; AFOSR-84-0481TR) Avail: NTIS HC A04/MF A01 CSCL 05/10

Two passages, each consisting of a 13 and 19 sentence version, were constructed from the same essay on the development of the atom bomb. The passage sentences are individually typed on index cards, and the four resulting packets were then scrambled. Subjects were undergraduate psychology students at the University of Colorado who received one of the four scrambled orders of sentences. Subjects serially reconstructed the passages using a slotted board. In the feedback condition subjects were given five tokens to determine if a card had been appropriately placed. The no-feedback students did not receive any assistance in determining the correctness of placement. In both conditions subjects signalled when they thought they were through. The dependent measures were time (in minutes), number of moves, concordance with the author's original order of sentences, percentage recall (the number of idea units recalled), and percentage recognition (choosing the original sentence from a pair containing a paraphrase. The recall and recognition measures were given directly after completion of the task. The independent variables were feedback/no-feedback, content, and number of sentences. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N84-29464*# Georgia Inst. of Tech., Atlanta. Center for Man-Machine Systems Research.
PILOT INTERACTION WITH AUTOMATED AIRBORNE DECISION MAKING SYSTEMS Semiannual Progress Report, Mar. -

Aug. 1983
William B. Rouse, John M. Hammer, Nancy M. Morris, Edward N. Brown, and Wan C. Yoon Aug. 1983 73 p refs
(Grant NaG2-123)
(NASA-CR-173782; NAS 1.26:173782) Avail: NTIS HC A04/MF A01 CSCL 05H

The use of advanced software engineering methods (e.g., from artificial intelligence) to aid aircraft crews in procedure selection and execution is investigated. Human problem solving in dynamic environments as effected by the human's level of knowledge of system operations is examined. Progress on the development of full scale simulation facilities is also discussed. M.A.C.

N84-29465*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PHYSIOLOGICAL, PSYCHOLOGICAL, AND SOCIAL EFFECTS OF NOISE
Karl D. Kryter (Acousis Co., Bodega Bay, Calif.) Jul. 1984 654 p refs
(Contract NAS1-15435)
(NASA-RP-1115; L-15612; NAS 1.61:1115) Avail: NTIS HC A99/MF A01 CSCL 20A

The physiological, and behavioral effects of noise on man are investigated. Basic parameters such as definitions of noise, measuring techniques of noise, and the physiology of the ear are presented prior to the development of topics on hearing loss, speech communication in noise, social effects of noise, and the health effects of noise pollution. Recommendations for the assessment and subsequent control of noise is included. For individual titles, see N84-29466 through N84-29477.

N84-29466*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DEFINITIONS OF NOISE AND NOISE POLLUTION c71
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 1-3 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 20A

The definitions of noise and noise pollution are examined with emphasis on the psychological, physiological, sociological and economic impacts on personnel and the environment. M.A.C.

N84-29467*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PHYSICAL MEASURES OF SOUND AND NOISE c71
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 5-24 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 20A

The physical measurement of sound is examined through basic definitions and measuring techniques. The terminology of acoustics is presented with noise characterization, graphs, and mathematical formulas included. M.A.C.

N84-29468*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PHYSIOLOGICAL FUNCTIONING OF THE EAR AND MASKING c52
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 25-56 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 06P

The physiological functions of the ear and the role masking plays in speech communication are examined. Topics under investigation include sound analysis of the ear, the aural reflex, and various types of noise masking. M.A.C.

N84-29469*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPEECH COMMUNICATIONS IN NOISE c32
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 57-110 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 17B

The physical characteristics of speech, the methods of speech masking measurement, and the effects of noise on speech communication are investigated. Topics include the speech signal and intelligibility, the effects of noise on intelligibility, the articulation index, and various devices for evaluating speech systems. M.A.C.

N84-29470*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LOUDNESS, NOISINESS, AND VIBRATION EFFECTS
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 111-174 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The physical measurement of noise that determines psychological and physical behavioral effects in real life is investigated. The roles of loudness and noisiness judgement in the development of these measurement procedures are also examined. M.A.C.

N84-29471*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRESBYCUSIS, SOCIOCUSIS, AND NOSOCUSIS
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 175-218 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The establishment of a baseline of normal hearing is investigated through the examination of pure tone hearing level surveys and variables such as age, sociocusis, sex, race, and otological disorders. Mathematical formulae used to predict hearing levels in industrial and nonindustrial surveys is included. M.A.C.

N84-29472*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NOISE-INDUCED HEARING LOSS AND ITS PREDICTION c52
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 219-330 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 06P

There are two somewhat different questions to be answered from data showing a permanent shift in the threshold of hearing (i.e., hearing loss) because of exposure to noise. The most fundamental question is what is the maximum level of daily noise exposure over a period of years that will not cause a measurable hearing loss (beyond that due to aging) in general population. The second question, and one of practical interest to industry, is what level of industrial noise exposure causes measurable noise-induced hearing loss in factory workers? Selected data on hearing level (HL) and present state-of-the-art solutions related to the measurement and prediction of noise-induced permanent threshold shift (NIPTS) and temporary threshold shift (TTS) are presented. A brief summary of some articles and reports published since 1963 on procedures for predicting NIPTS from exposure to noise is given. B.G.

N84-29473*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NOISE-INDUCED HEARING IMPAIRMENT AND HANDICAP c52
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 331-342 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 06P

A permanent, noise-induced hearing loss has doubly harmful effect on speech communications. First, the elevation in the threshold of hearing means that many speech sounds are too weak to be heard, and second, very intense speech sounds may appear to be distorted. The whole question of the impact of noise-induced hearing loss upon the impairments and handicaps experienced by people with such hearing losses was somewhat controversial partly because of the economic aspects of related practical noise control and workmen's compensation. Author

N84-29474*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MENTAL AND PSYCHOMOTOR TASK PERFORMANCE IN NOISE
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 343-388 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

The possible adverse effects of noise on mental and psycho-

motor task performance were a matter of practical concern for centuries and continue to be a matter of scientific controversy. A review indicates that except for the masking or interferences with the hearing of sounds needed to perform a given task, noise does not necessarily interfer with work performance. However, because of difficulties in the experimental control of some of these possible effects, the results of research on work performance in noise were inconsistent and difficult to encompass in any simple theoretical construct. Indeed, reviews of research in this area conclude that simple generalizations about possible effects of noise on work performance cannot be made. Nevertheless, several general theories were put forth. B.G.

N84-29475*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NONAUDITORY-SYSTEM RESPONSE TO NOISE AND EFFECTS ON HEALTH
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 389-524 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Continued exposure to noise in real life can be a source of physiological stress possibly capable of causing health disorders beyond that of direct damage to the auditory receptor system. Some theorists hold that some of these effects occur because of innate, reflexive responses to noise that cannot be prevented or, when suppressed, that require some effort that may itself become somewhat debilitting in time. An alternative theory is that the truly nonhabituating reflexive responses to noise are not sufficient in character to cause any ill health, and that those responses to noise that are or could be significant in this regard are not directly the result of exposure to noise but are responses to the emotional meanings conveyed by the sounds. Obviously, the degree to which noise can lead to harm to nonauditory physiological systems of the body are questions of utmost importance for the assessment of the need for noise control. Author

N84-29476*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REACTIONS TO COMMUNITY NOISE
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 525-606 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 05H

Most of the research on reactions of people to community noise is divided into studies of annoyance as measured by attitude surveys and annoyance as measured by complaint behavior, including legal actions. This research has provided means of testing the concept promulgated over 20 years ago that the average amount of noise energy from significant sources that intrudes daily into houses and living areas can be used to predict the impact of the noise on people in a community. However, research data on annoyance and complaint behavior collected over the past 10 to 20 years have shown that there are significant limitations and variables that must be considered in the fair application of the noise energy concept in its simplest form. Author

N84-29477*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GUIDELINES FOR ASSESSMENT AND CONTROL OF NOISE **c71**
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 607-646 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 20A

There is an obvious need for guidelines and standards with respect to what intensities and durations of noise exposure is considered incompatible with the health and well-being of the people exposed. These guidelines would presumably be useful for the zoning of land areas to avoid overexposure of people to environmental noise and for legislative-judicial adjudication of liabilities for possible damages to individuals and groups from exposure to noise. A number of guidelines for noise exposure were promulgated by various governmental agencies for these purposes. Partly because of the need for an integrated and consistent program of noise control for all elements of the government, the United States Environmental Protection Agency (EPA) was established. In addition to previously issuing some specific documents regarding safe noise exposure limits, the EPA joined several Federal operating and regulatory agencies in issuing guidelines for considering noise in land use planning and control. Government guideline documents, as well as some issued by non-government agencies, are examined. Also, newly proposed guidelines for noise in residential areas, and the scientific basis for these guidelines, are presented. Author

N84-29478*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
UNDERSTANDING A TECHNICAL LANGUAGE: A SCHEMA-BASED APPROACH
Pierre Falzon (Institute National de Recherche d'Information et d'Automatique, Rocquencourt, France) Jul. 1984 28 p refs
(NASA-TM-85868; A-5694; NAS 1.15:85868) Avail: NTIS HC A03/MF A01 CSCL 05H

Workers in many job categories tend to develop technical languages, which are restricted subjects of natural language. A better knowledge of these retrictions provides guidelines for the design of the restricted languages of interactive systems. Accordingly, a technical language used by air-traffic controllers in their communications with pilots was studied. A method of analysis is presented that allows the schemata underlying each category of messages to be identified. This schematic knowledge was implemented in programs, which assume that the goal-oriented aspect of technical languages (and particularly the restricted domain of discourse) limits the processes and the data necessary in order to understand the messages (monosemy, limited vocabulary, evocation of the schemata by some command words, absence of syntax). The programs can interpret, and translate into sequences of action, the messages emitted by the controllers. Author

N84-29479*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HUMAN EXPOSURE IN LOW EARTH ORBIT
John W. Wilson and Frank Cucinotta (Old Dominion Univ.) Aug. 1984 22 p refs
(NASA-TP-2344; L-15803; NAS 1.60:2344) Avail: NTIS HC A02/MF A01 CSCL 06R

Human exposure to trapped electrons and protons in low Earth orbit (LEO) is evaluated on a basis of a simple approximation of the human geometry for spherical shell shields of varying thickness. A data base is presented that may be used to make preliminary assessment of the impact of radiation exposure constraints on human performance. Detailed shielding studies should be performed before final design considerations. A sample impact assessment is discussed on the basis of presently accepted allowable exposure limits. A brief discussion is given on the anticipated impact of an ongoing reassessment of allowable exposure limits. Author

N84-29480# Illinois Univ., Urbana. Engineering-Psychology Research Lab.
A MULTIPLE PROCESSING RESOURCE EXPLANATION OF THE SUBJECTIVE DIMENSIONS OF OPERATOR WORKLOAD
W. L. Derrick and C. D. Wickens Feb. 1984 93 p
(Contract N00014-79-C-0658)
(AD-A141455; EPL-84-2/ONR-84-1) Avail: NTIS HC A05/MF A01 CSCL 05/8

Multiple measures of operator workload may dissociate, or fail to agree, for a given task. The goal of this study was to determine which task difficulty (workload) as indexed by attentional resource demand could explain the attendant variance in a second index of workload, subjective ratings. A multiple resource model of processing resources (Wickens, 1980) guided construction of tasks of differential resource demand. These tasks were both performed by subjects and rated according to workload similarity. Scaling and clustering analyses of the similarity data produced subjective dimensions/clusters of workload that were explained in terms of resource demand, task structure, and task characteristics. Data

collected to support this analysis - task performance, physiological measures of heart period variability, effort ratings - revealed three primary dissociations. These dissociations were explained by using the parameters of Wickens' multiple resource theory. GRA

N84-29481# Naval Training Equipment Center, Orlando, Fla.
ANNOTATED BIBLIOGRAPHY OF HUMAN FACTORS LABORATORY REPORTS (1945-1968): SUPPLEMENT 4, 1979-1983
Jan. 1984 36 p
(AD-A142141; NAVTRAEQUIPC-IH-158) Avail: NTIS HC A03/MF A01 CSCL 05/5

A complete bibliographic reference and an abstract are given for each publication of the Human Factors Laboratory from 1979 through 1983 including in-house and contractor-developed documents. Three indexes are provided: Index by Source, Author Index, and Subject Matter Index. GRA

N84-29482# Defence Research Establishment, Ottawa. (Ontario).
GUIDELINES FOR MAN/DISPLAY INTERFACES WITH RELEVANCE TO MILITARY ENVIRONMENTS
B. Ford Mar. 1984 42 p
(AD-A142171; DREO-TN-84-3) Avail: NTIS HC A03/MF A01 CSCL 05/8

The report presents guidelines for developing a man/display interface. Military environment requirements are addressed. The guidelines include: methods of highlighting the displays; techniques for minimizing operator confusion and error; methods for system prompt, and user reply; choice of hardware control devices; and consideration of display and system peripheral ergonomics. GRA

N84-29483# Department of the Army, Washington, D. C.
AN EXPLOSIVE ORDNANCE DISPOSAL PROTECTIVE SUIT Patent Application
R. Martone, inventor (to Army) Filed 5 Jun. 1984 14 p
(AD-D011072; US-Patent-Appl-SN-596778) Avail: NTIS HC A02/MF A01 CSCL 06/17

An explosive ordnance disposal protective suit which includes trousers, a coat with collar, a protective helmet and a combination face shield-chest plate. The face shield-chest plate is supported and held in place by a pocket on the front of the coat. The chest plate is made of laminated layers of woven glass roving fabric. The face shield is a laminate of an optically clear polycarbonate sheet adhesively bonded to an optically clear acrylic sheet. GRA

N84-29484# Department of the Air Force, Washington, D.C.
ACCOMMODATIVE AMPLITUDE AND SPEED MEASURING INSTRUMENT Patent Application
L. V. Genco and H. L. Task, inventors (to Air Force) Filed 22 Feb. 1984 14 p
(AD-D011032; US-Patent-Appl-SN-582496) Avail: NTIS HC A02/MF A01 CSCL 06/12

In accordance with the foregoing principles and objects of the present invention, a novel instrument and method for measuring the accomodative amplitude and speed of the eye of a subject is described. The instrument for making the measurements according to the present invention comprises a pair of illuminated or luminous visual displays disposed for viewing along an optical axis, the images of the displays superimposed upon each other for viewing by a subject, one of the displays comprising a pattern having a plurality of distinct and recognizable oreintations with respect to the axis along which it is viewed, an orientation generator for randomly and alternately generating one of the orientations for viewing by the subject, a switch operable by the subject for turning the displays off and indicating the observed orientation of the random pattern, and the time the displays were on or the time between presentation of one display and the correct identification of the other. GRA

N84-29485# California Univ., Berkeley. Lawrence Berkeley Lab. Applied Science Div.
CALCULATION OF NATURAL VENTILATION AND COMFORT
Max Sherman and Sophia Ashley Jan. 1984 33 p refs Presented at the Am. Soc. of Heating, Refrig. and Air-Conditioning Engr. Meeting, Atlanta, 29 Jan. - 1 Feb. 1984
(Contract DE-AC03-76SF-00098)
(DE84-009215; LBL-16036; CONF-840124-6) Avail: NTIS HC A03/MF A01

Natural ventilation can be used to greatly reduce cooling loads and increase human comfort in buildings in hot, humid climates. Airflow rates directly affect a building's heat balance by removing internal gains and directly affect comfort levels by increasing the body's convective and evaporative heat transfer coefficients; these airflow rates are determined by the wind pressure on the faces of the building (which is calculated from the wind speed and pressure coefficient) and the amount of open area. Wind pressure coefficients can be obtained in three ways: (1) direct field measurement, (2) by scale model experiments in a wind tunnel, and (3) by comparison with standard wind tunnel data. Measurements made on two buildings at the Kaneohe Marine Corps Air Station (KMCAS) on the island of Oahu, Hawaii, during the summer of 1982 are described. These full scale measurements of pressure coefficients will be compared to reduced scale measurements made at the boundary layer wind tunnel at the Naval Civil Engineering Laboratory (NCEL). Estimates of the indoor comfort levels for different window conditions will be used as a basis for determining the acceptability of natural ventilation for cooling. DOE

N84-29486# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
IMPROVED G-TOLERANCE WITH ASSISTED POSITIVE PRESSURE BREATHING AND ANTI-GRAVITY SUIT WITH READY PRESSURE AND FASTER FILLING
Ulf I. Balldin Feb. 1984 40 p refs In SWEDISH; ENGLISH summary
(FOA-A-58002-H1; ISSN-0281-0239) Avail: NTIS HC A03/MF A01

Methods to enhance G-tolerance are discussed, including improved physiological selection of pilots, G-Training in human centrifuge, muscle strength training, and technological solutions. A ready pressure anti-G suit, adjustable in magnitude and time is described. Filling time of the anti-G suit (to 90%) is reduced from 5 to 1 sec, preferably initiated by flight control impulses through the main computer of the aircraft at G-loads exceeding 2 F; positive pressure breathing and assisted positive pressure breathing, are activated at G-loads exceeding 3 to 4 G proportionally to the G-load of G onset rate and with a maximum of 6 to 8 kPa assisted breathing pressure. Author (ESA)

N84-28835# Joint Publications Research Service, Arlington, Va.
FOOD SPECIALISTS DISCUSS COSMONAUT DIET
A. Maltsev and M. Frumkin *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 43-45 Transl. into ENGLISH from Pravda (USSR), 22 Sep. 1983 p 3 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N84-29487# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.

A DISTRIBUTED MEMORY MANAGEMENT SYSTEM FOR PASM

J. T. Kuehn, H. J. Siegel, and M. Grosz Oct. 1983 10 p Presented at the Computer Society Workshop on Computer Architecture for Pattern Anal. and Image Database Management, Oct. 1983 p 101-108

(Grant AF-AFOSR-3581-78; AF Proj. 2304)

(AD-A141360; AFOSR-84-0377TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

A large scale multimicroprocessor system (PASM) used as a tool for studying parallel image processing and pattern recognition algorithms is discussed. The architecture of PASM is overviewed with an emphasis placed upon the subsystems which manage the data and program files. The interactions of the Memory Management System processors, secondary storage devices, and Parallel Computation Unit are detailed. A file directory system for files distributed over many primary and secondary memory units is proposed. The requirements for loading parallel programs, including the format of object files, are also given. Author

N84-29488# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE FORECASTS OF COMPUTERS AND THE POLICY-MAKING OF CHINA

H. Bochuan 15 May 1984 11 p Transl. into ENGLISH from Weilai yu Fazhan (China), v. 4, no. 2, 1983 p 41, 42-44

(AD-A141557; FTD-ID(RS)T-0435-84) Avail: NTIS HC A02/MF A01 CSCL 09/2

In order to understand the future of computers and take countermeasures, their history must be studied because rarely does a research subject with such a strong realistic significance as the study of the future rely so heavily on past history. The most complete picture of the computer for comparative analysis is in the United States and Japan. Several major comparisons are made Chinese policy is then determined. B.G.

N84-29489# Washington Univ., Seattle. Dept. of Psychology.

USING INTERACTIVE COMPUTING TO EXPAND INTELLIGENCE TESTING: A CRITIQUE AND PROSPECTUS

E. Hunt and J. Pellegrino May 1984 66 p Prepared in cooperation with California Univ., Santa Barbara, Dept. of Psychology

(Contracts N00014-80-C-0631; N00014-81-C-0616)

(AD-A141657; TR-84-2) Avail: NTIS HC A04/MF A01 CSCL 09/2

Microcomputers can serve as automated testing stations for use in psychometric assessment. There are economic advantages in conducting aptitude and intelligence testing with such stations. Is it possible to improve the quality of cognitive assessment by extending the range of cognitive abilities to be assessed? Two types of extension are considered; modifying and expanding testing procedures for psychological functions that are components of conventional tests, and the extension of testing to psychological functions not generally assessed by conventional intelligence or aptitude tests. Computerized presentations will make relatively little difference in our ways of testing verbal comprehension. Computer controlled testing could well extend the ways in which we evaluate spatial-visual functioning and memory. The impact of testing on the evaluation of reasoning is unclear. Computer-controlled item presentation makes it possible to conceive of tests of learning and attention, neither of which are evaluated in most psychometric programs today. The psychological nature of the abilities being assessed raises problems in assessment that are irrelevant to the use of computers. Some research questions are identified that ought to be explored before testing is extended into these fields. Computer-controlled evaluation could be extended to the assessment of criterion performance, either in the normal working situation or in a simulation of the workplace. GRA

N84-29490# Naval Postgraduate School, Monterey, Calif.

A DESIGN METHOD FOR A STATE FEEDBACK MICROCOMPUTER CONTROLLER OF A WIDE BANDWIDTH ANALOG PLANT M.S. Thesis

K. C. Kim Dec. 1983 112 p

(AD-A142101; AD-F300432) Avail: NTIS HC A06/MF A01 CSCL 09/2

In the design of a microcomputer regulator, continuous or discrete method can be applied. The objective of this thesis is to provide a continuous controller design method that can be used to compensate for the effect of the microcomputer transport lag. The compensation over the frequency range of interest yields a regulator response approximately equivalent to a direct analog feedback controller. The technique uses state feedback method for development of the required phase compensation. The continuous system design is additionally compared to the discrete system design for the second order system numerical example. The method however is shown to be general enough to also apply to higher order system. Author (GRA)

N84-29491# California Univ., Berkeley. Lab. for Electronics Research.

DESIGN METHODOLOGY FOR BACK-END DATABASE MACHINES IN DISTRIBUTED ENVIRONMENTS Technical Report

C. V. Ramamoorthy May 1984 62 p

(Contract DAAG29-83-K-0086)

(AD-A142122; ARO-19159.1-EL) Avail: NTIS HC A04/MF A01 CSCL 09/2

The design methodologies for database machines are introduced, both at virtual architecture and physical architecture levels. Starting from requirement specification, the architectures are derived through stepwise refinement and validation. Special attention is also paid to the impacts of VLSI technology.

Author (GRA)

N84-29492# Naval Postgraduate School, Monterey, Calif.

REAL-TIME APPLICATIONS IN MULTIPROCESSOR SYSTEMS M.S. Thesis

M. K. Ozyurt Dec. 1983 121 p

(AD-A142130) Avail: NTIS HC A06/MF A01 CSCL 09/2

This thesis builds a simulation model of a tactical fire control system in a real time environment, using a tightly connected multi-processing system consisting of two single board computers. The additional hardware used in this project consists of an ADM-3A video terminal with a built-in retrographics feature, and MDS microprocessor development system, an analog-to-digital converter, and two sets of triplet potentiometers. The potentiometers are used to feed analog information about ownship, targetship, and gun position to the simulation model, which then evaluates and computes projected target positions and gun control parameters, and displays the results. Author (GRA)

N84-29493# Carnegie Inst. of Tech., Pittsburgh, Pa. Dept. of Computer Science.

THE C.mmp MULTIPROCESSOR

S. H. Fuller and S. P. Harbison 27 Oct. 1978 31 p

(Contract F33615-78-C-1551; ARPA Order 3597)

(AD-A142132; CMU-CS-78-146) Avail: NTIS HC A03/MF A01 CSCL 09/2

C.mmp1 is archtypical of a simple multiprocessor; it consists of a number of equal, asynchronous central processors that share a large primary memory. C.mmp differs from earlier multiprocessors such as the Burroughs D825, IBM 360/67, Honeywell 645 (Multics), etc., in two essential respects: (1) C.mmp is designed to have up to sixteen processors while other multiprocessors usually have no more than four processors, (2) C.mmp is constructed from minicomputer processors rather than the larger (32 to 48 bits/word)

processors used in the other systems. In other words, the effective use of C.mmp requires that we find and exploit a much higher degree of parallelism than has been needed by earlier multiprocessors. In the past few years, the number of existing multiprocessors has increased significantly to include BBN's Pluribus, Stanford's S-1, and CMU's CM* systems. However, C.mmp still remains notable for its uniform structure and support of a general-purpose operating system. Moreover, performance studies of C.mmp provide calibration for similar data from these newer machines. GRA

N84-29494# SRI International Corp., Menlo Park, Calif.
DISTRIBUTED AVIONIC COMPUTERS Final Report
K. N. Levitt, P. M. Melliar-Smith, and R. L. Schwartz Oct. 1983 88 p
(Contract N00019-82-C-0087)
(AD-A142140) Avail: NTIS HC A05/MF A01 CSCL 09/2

The goal of the task described in this report is to establish the basis for an advanced fault-tolerant onboard computer that will be the successor to the current generation of fault-tolerant computers. Towards this goal we are working on the following technical problems: (1) The architecture of a network-based fault-tolerant system; (2) The diagnosis of transient faults from error reports; (3) The use of Ada as the language for the executives of the computer and the application programs; and (4) A new paradigm (an extension of the conventional voting paradigm) for comparing the values produced by replicated processors. GRA

N84-29495# California Univ., Berkeley. Dept. of Electrical Engineering and Computer.
[DESIGN AND PERFORMANCE OF A DISTRIBUTED RELATIONAL DATA BASE SYSTEM] Technical Report, 15 Nov. 1981 - 30 Sep. 1983
R. S. Fabry and C. Sequin 30 Sep. 1983 172 p
(Contract N00039-82-C-0235; ARPA Order 4031)
(AD-A142177) Avail: NTIS HC A08/MF A01 CSCL 09/2

This paper briefly presents the design of a distributed relational data base system. Then, the authors discuss experimental observations of the performance of that system executing both short and long commands. Conclusions are also drawn concerning metrics that distribute query processing heuristics should attempt to minimize. Lastly, they comment on architectures which appear viable for distributed data base applications. Author (GRA)

N84-29496# Los Alamos Scientific Lab., N. Mex.
LEARNING ABOUT SUPERCOMPUTERS ON A MICROCOMPUTER WITH NO KEYBOARD: A SCIENCE MUSEUM EXHIBIT
M. Stoddard and B. L. Buzbee 1984 9 p refs Presented at 25th Ann. ADCIS Conf., Columbus, Ohio, 14 May 1984
(DE84-001177; LA-UR-83-2635; CONF-840539-1) Avail: NTIS HC A02/MF A01

A microcomputer exhibit is developed to acquaint visitors of the Los Alamos National Laboratory's Bradbury Science Museum with supercomputers and computer graphics applications. The exhibit is highly interactive, yet the visitor uses only the touch panel of the CD 110 microcomputer. Design details of how each constraint is dealt with to produce a motivating and instructional exhibit are provided. Although the program itself deals with a subject area primarily applicable to Los Alamos, the design features are transferrable to other courseware where motivational and learning aspects are of equal importance. DOE

N84-29497# North Carolina State Univ., Raleigh. Dept. of Materials Engineering.
PRECISION DIGITAL DILATOMETRY: A MICROCOMPUTER-BASED APPROACH TO SINTERING STUDIES Final Technical Report
A. D. Batchelor, M. J. Paisley, T. M. Hare, and H. Palmour, III Nov. 1983 24 p refs
(Contract DE-AC09-81SR-10957)
(DE84-009794; DOE/SR-10957/3) Avail: NTIS HC A02/MF A01

Representing significant advances in precision, atmosphere control, programming flexibility, experimental convenience and rate controlled sintering capability, a new University constructed instrument designed for operation to 1873K incorporates evolutionary thermal and mechanical features with novel microcomputer based functions for measurement, control, data logging, data reduction, and graphical data representation. Principal design features, hardware selections, and performance data are reviewed: rationales for software development are discussed and typical sintering applications shown. DOE

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N84-29498*# Old Dominion Univ., Norfolk, Va. Dept. of Physics.
PROGRAMMING FOR ENERGY MONITORING/DISPLAY SYSTEM IN MULTICOLOR LIDAR SYSTEM RESEARCH Progress Report, 15 Jun. 1980 - 14 Jun. 1981
Ramon C. Alvarado, Jr. and Robert J. Allen Mar. 1982 110 p refs
(Contract NCC1-32)
(NASA-CR-165875; NAS 1.26:165875; PTR-81-11) Avail: NTIS HC A06/MF A01 CSCL 09B

The Z80 microprocessor based computer program that directs and controls the operation of the six channel energy monitoring/display system that is a part of the NASA Multipurpose Airborne Differential Absorption Lidar (DIAL) system is described. The program is written in the Z80 assembly language and is located on EPROM memories. All source and assembled listings of the main program, five subroutines, and two service routines along with flow charts and memory maps are included. A combinational block diagram shows the interfacing (including port addresses) between the six power sensors, displays, front panel controls, the main general purpose minicomputer, and this dedicated microcomputer system. M.A.C.

N84-29499*# Alabama Univ., Huntsville. Dept. of Computer Science.
DIGITAL SYSTEMS DESIGN LANGUAGE. DESIGN SYNTHESIS OF DIGITAL SYSTEMS Contractor Report, 1 Oct. 1978 - 30 Sep. 1979
Sajjan G. Shiva Oct. 1979 128 p refs
(Contract NAS8-33096)
(NASA-CR-162032; NAS 1.26:162032) Avail: NTIS HC A07/MF A01 CSCL 09B

The Digital Systems Design Language (DDL) is implemented on the SEL-32 computer systems. The details of the language, translator and simulator programs are included. Several example descriptions and a tutorial on hardware description languages are provided, to guide the user. M.A.C.

N84-29500*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRODUCTION VERSION OF THE EXTENDED NASA-LANGLEY VORTEX LATTICE FORTRAN COMPUTER PROGRAM. VOLUME 2: SOURCE CODE
Henry E. Herbert (Computer Science Corp.) and John E. Lamar Apr. 1982 149 p refs
(NASA-TM-83304; NAS 1.15:83304) Avail: NTIS HC A07/MF A01 CSCL 09B

The source code for the latest production version, MARK IV, of the NASA-Langley Vortex Lattice Computer Program is presented. All viable subcritical aerodynamic features of previous versions were retained. This version extends the previously documented program capabilities to four planforms, 400 panels, and enables the user to obtain vortex-flow aerodynamics on cambered planforms, flowfield properties off the configuration in attached flow, and planform longitudinal load distributions. Author

N84-29501*# Vought Corp., Dallas, Tex.
MOMENTS OF INCLINATION ERROR DISTRIBUTION COMPUTER PROGRAM
T. R. Myler Hampton, Va. NASA. Langley Research Center Dec. 1981 51 p
(Contract NAS1-15000)
(NASA-CR-165824; NAS 1.26:165824) Avail: NTIS HC A04/MF A01 CSCL 09B

A FORTRAN coded computer program is described which calculates orbital inclination error statistics using a closed-form solution. This solution uses a data base of trajectory errors from actual flights to predict the orbital inclination error statistics. The Scott flight history data base consists of orbit insertion errors in the trajectory parameters - altitude, velocity, flight path angle, flight azimuth, latitude and longitude. The methods used to generate the error statistics are of general interest since they have other applications. Program theory, user instructions, output definitions, subroutine descriptions and detailed FORTRAN coding information are included. M.G.

N84-29502*# Boeing Computer Services, Inc., Seattle, Wash. Space and Military Applications Div.
SOFTWARE RELIABILITY: ADDITIONAL INVESTIGATIONS INTO MODELING WITH REPLICATED EXPERIMENTS
P. M. Nagel, F. M. Schotz, and J. A. Skirvan Jun. 1984 112 p refs
(Contract NAS1-16481)
(NASA-CR-172378; NAS 1.26:172378; BCS-40446) Avail: NTIS HC A06/MF A01 CSCL 09B

The effects of programmer experience level, different program usage distributions, and programming languages are explored. All these factors affect performance, and some tentative relational hypotheses are presented. An analytic framework for replicated and non-replicated (traditional) software experiments is presented. A method of obtaining an upper bound on the error rate of the next error is proposed. The method was validated empirically by comparing forecasts with actual data. In all 14 cases the bound exceeded the observed parameter, albeit somewhat conservatively. Two other forecasting methods are proposed and compared to observed results. Although demonstrated relative to this framework that stages are neither independent nor exponentially distributed, empirical estimates show that the exponential assumption is nearly valid for all but the extreme tails of the distribution. Except for the dependence in the stage probabilities, Cox's model approximates to a degree what is being observed. Author

N84-29503*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A NEW MINIMAX ALGORITHM Final Report
Avi Vardi (RAFAEL, Armament Development Authority, Haifa, Israel) Jun. 1984 38 p refs
(Contract NAS1-15810)
(NASA-CR-172382; NAS 1.26:172382; ICASE-84-25) Avail: NTIS HC A03/MF A01

The representation min t s.t. F(I)(x). - t less than or equal to 0 for all i is examined. An active set strategy is designed of functions: active, semi-active, and non-active. This technique will help in preventing zigzagging which often occurs when an active set strategy is used. Some of the inequality constraints are handled with slack variables. Also a trust region strategy is used in which at each iteration there is a sphere around the current point in which the local approximation of the function is trusted. The algorithm is implemented into a successful computer program. Numerical results are provided. M.A.C.

N84-29504# General Research Corp., Santa Barbara, Calif.
COBOL AUTOMATED VERIFICATION SYSTEM, IMPLEMENTATION PHASE Final Technical Report, Oct. 1981 - May 1983
Richard A. Melton and William R. Wisehart Dec. 1983 43 p
(Contract F30602-80-C-0101; AF Proj. 2527)
(AD-A141063; GRC-CR-10-970; RADC-TR-83-284) Avail: NTIS HC A03/MF A01 CSCL 09/2

As the cost of computer hardware continues to fall, more and more ambitious software applications are conceived. The conversion of the ambitious conceptions into complete and reliable final products, on budget and within schedule, continues to be an elusive goal for the majority of projects. Much emphasis is being placed on solving this problem with tools and techniques that are applicable throughout the software life cycle. The objective was to design and implement a tool for analyzing and testing COBOL source programs. The tool, called CAVS, for COBOL Automated Verification System, is a prototype of a software tool to improve the reliability and maintainability of COBOL software systems. CAVS can be applied during the testing, verification, validation, and error detection/correction phases of software development. GRA

N84-29505# University of Southern California, Marina del Rey.
SPECIFICATION AND TRANSFORMATION: AUTOMATED IMPLEMENTATION
M. S. Feather Apr. 1984 12 p Presented at Processings of the Program Transformation and Programming Environments Workshop, Sep. 1983, Munich, Sponsored in part by Grant NSF MCS-79-18792
(Contract F30602-79-C-0042; Grant NSF MCS-79-18792)
(AD-A141064; ISI/RS-83-C-0335) Avail: NTIS HC A02/MF A01 CSCL 09/2

The research group at ISI (Information Science Institute) aims to improve the program development process by applying program transformation to develop implementations from specification. The uses of specifications imply the criteria for a specification language - understandability, testability, and maintainability. We have designed our own specification language, Gist, to meet these criteria. We have sought inspiration for Gist's constructs from the power found in descriptions expressed in natural language. The justifications for our approach are outlined. Our experiences with specifications in Gist, and subsequent transformation of such specifications, suggest implications for the processes of specification and transformation. References point the way to more details on the various issues. GRA

N84-29506# University of Southern California, Marina del Rey. Information Sciences Inst.
TOOLS FOR SPECIFICATION VALIDATION AND UNDERSTANDING Final Technical Report, 29 Jan. 1981 - 31 May 1983
Robert Balzer, Donald Cohen, and William Swartout Griffiss AFB, N.Y. RADC Dec. 1983 62 p
(Contract F30602-81-K-0056; AF Proj. 5581)
(AD-A141079; RADC-TR-83-292) Avail: NTIS HC A04/MF A01 CSCL 09/2

Regardless of the specification language used, formal program specifications can be tough to understand. Yet, because a specification is frequently the means by which a customer communicates his desires to a programmer, it is critical both the customer and programmer be able to examine and comprehend the specification. Our experience with Gist, a high-level specification language being developed at ISI (Information Science Institute) has indicated that two of the major impediments to understandability are the unfamiliar syntactic constructs of the language and non-obvious interactions between parts of the specification that are often widely separated. These interactions may cause the specification to denote behaviors that were unintended by the original or not to denote behaviors that were intended. This report documents our efforts to overcome these impediments by constructing tools to make specifications moe understandable, both to specifiers and to those unfamiliar with formal specification languages. GRA

N84-29507# Boeing Aerospace Co., Seattle, Wash.
MULTIPROCESSOR Z-BUFFER ARCHITECTURE FOR HIGH-SPEED, HIGH COMPLEXITY COMPUTER IMAGE GENERATION Final Report
Dec. 1983 313 p Original contains color illustrations
(Contract MDA903-82-C-0101)
(AD-A141083) Avail: NTIS HC A14/MF A01 CSCL 09/2

This report describes the results of the second phase of a

three-phase program to develop innovative, high-complexity computer image generation (CIG) system. The foundation of this CIG system is a multi-processor implementation of the z-buffer hidden-surface algorithm. The research program accomplished the following: Real-time special-purpose hardware to render shaded triangles into a displayable image; A non-real-time software simulation of the front-end of a CIG system; Software to construct databases from the Defense Mapping Agency's Digital Terrain Elevation Data tapes and from the output of a general-purpose CAD system; and Software developed to investigate additional topics in computer graphics, such as fractals, curved surfaces, transparencies, texture mapping, and level-of-detail control. GRA

N84-29508# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MICROCOMPUTER-BASED GRAPHICAL LINEAR PROGRAMMING PACKAGE M.S. Thesis
Michael L. Mullennex Dec. 1983 150 p
(AD-A141094; AFIT/GCS/OS/83D-2) Avail: NTIS HC A07/MF A01 CSCL 09/2

Linear Programming is an extremely powerful and widely used technique used in decision analysis. This paper describes the design, implementation and operation of an interactive, graphical linear programming software package implemented on a microcomputer. The software is written in Pascal and is supported by the UCSD Pascal Operating System. This operating system has allowed chaining between programs as well as extensive segmentation of procedures. The modularly implemented software package provides the user with the option of performing regular simplex and sensitivity analysis operations or graphical simplex and sensitivity analysis operations on a user-entered or preformatted linear programming problem. Should the user choose to perform regular simplex and sensitivity analysis operations on a problem, all results are displayed in tabular form on the screen. If the option chosen is graphical simplex and sensitivity analysis, the feasible region and simplex search procedure, as well as any changes to the objective function or feasible region as a result of sensitivity analysis, are displayed on the screen in high resolution, two-dimensional color graphics.
Author (GRA)

N84-29509# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AUTOMATED Q-GERT SOURCE CODE GENERATION USING COMPUTER AIDED DESIGN M.S. Thesis
G. M. Anderson and C. R. Commeford Dec. 1983 155 p
(AD-A141127; AFIT/GOR/OS/83D-2) Avail: NTIS HC A08/MF A01 CSCL 09/2

Accessibility of microcomputers has brought increased computing power to an analyst's fingertips. The purpose of this research is not to teach Q-Gert, but, to give an analyst familiar with Q-Gert a useful tool making simulation convenient and error free. The Pascal computer program developed within, uses an Apple microcomputer and Graphics Tablet to allow an analyst to create a Q-Gert simulation network using computer aided design techniques. The analyst need only select commands from the Graphics Tablet's programmed menu and answer questions regarding the symbols to be drawn. The program will display the network on the high resolution graphics screen and generate a text file containing the computer source code for input to the Q-Gert Analysis program residing on a mainframe computer. The basic concepts of Q-Gert are incorporated into the program. This includes source, regular, queue, statistic, and sink nodes along with activities and parameters. The program was written to be expandable for further development to include more complex concepts of Q-Gert. GRA

N84-29510# Air Force Human Resources Lab., Wright-Patterson AFB, Ohio.
SIMULATED 3-DIMENSIONAL COMPUTER GRAPHICS TRAINING DISPLAY FOR AIR WEAPONS CONTROLLERS. VOLUME 2: USERS GUIDE Final Report
L. S. Finegold, M. E. Wuest, and J. G. Flaugher Apr. 1984 70 p
(AF Proj. 3017)
(AD-A141336; AD-E950524; AFHRL-TP-83-62(2)) Avail: NTIS HC A04/MF A01 CSCL 09/2

Since current training devices and operational equipment provide only a two-dimensional display, the complexity of intercept geometry was difficult to display and teach. Specifically, the desired capability includes simulation of heading crossing angles, intercept vectors, turn points for intercepts, and bearing and range to targets. A guide to the operation of the research and development microcomputer system (Users Guide) is provided and the system is explained in detail, both for interactive (live-flying) control of the aircraft and for developing scripted mission scenarios for producing videstapes. B.G.

N84-29511# Air Force Human Resources Lab., Wright-Patterson AFB, Ohio.
SIMULATED 3-DIMENSIONAL COMPUTER GRAPHICS TRAINING DISPLAY FOR AIR WEAPONS CONTROLLERS, VOLUME 1 Final Report
L. S. Finegold, A. J. Asch, and J. G. Flaugher Apr. 1984 54 p
(AF Proj. 3017)
(AD-A141347; AFHRL-TP-83-62(1)) Avail: NTIS HC A04/MF A01 CSCL 09/2

A simulated three-dimensional computer graphics display system was developed to address issues critical to the training of Air Force air weapons controllers; primarily those training issues related to three-dimensional air intercept tactics and geometry. The research and development system provided the capability to display and control up to three aircraft in a defined airspace, plus the addition of supplemental graphics to address specific training issues, using full-color, raster-scan, animated microcomputer display technology. To transition this technology to the training environment, two training video tapes were produced and delivered to the 325 Weapons Controller Training Squadron (formerly the USAF Interceptor Weapons School), where they are being incorporated into the training syllabus. An overview and summary of the project. Author (GRA)

N84-29512# Aerospace Corp., El Segundo, Calif. Guidance and Control Div.
LCAP2 (LINEAR CONTROLS ANALYSIS PROGRAM). VOLUME 3: SOURCE CODE DESCRIPTION Final Report
E. A. Lee 15 Nov. 1983 299 p
(Contract F04701-83-C-0084)
(AD-A141386; TR-0084(9975)-1-Vol-3; SD-TR-84-06-Vol-3) Avail: NTIS HC A13/MF A01 CSCL 09/2

The computer program LCAP2 (Linear Controls Analysis Program) provides the analyst with the capability to numerically perform classical linear control analysis techniques such as transfer function manipulation, transfer function evaluation, frequency response, root locus, time response and sampled-data transforms. It is able to deal with continuous and sampled-data systems, including multiloop multirate digital systems, using s, z and w transforms. This volume contains source code descriptions.
Author (GRA)

N84-29513# Texas Univ., Austin. Austin Center for Cybernetic Studies.
THE DUALITY BETWEEN EXPECTED UTILITY AND PENALTY IN STOCHASTIC LINEAR PROGRAMMING
A. Ben-Tal (Technion-Israel Inst. of Tech., Haifa) and M. Teboulle (Technion-Israel Inst. of Tech., Haifa) Dec. 1983 17 p
(Contracts N0014-81-C-0236; N00014-82-K-0295; Grant NSF ECS-82-14081)
(AD-A141393; CCS-RR-478) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document studies the dual problem corresponding to a linear program in which the stochastic objective function is replaced by its expected utility, and discusses its relevance as a penalty method to a stochastically constrained dual linear program. GRA

N84-29514# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics and Logistics Dept.
INTERACTIVE SIGNAL AND PATTERN ANALYSIS AND

RECOGNITION SYSTEMS (ISPARS). USERS' GUIDE Interim Report, Sep. 1979 - Sep. 1980
W. Parsons, J. Garner, J. Carlberg, and S. Berkowitz Mar. 1984 137 p
(ONR Proj. SR0-1403)
(AD-A141421; AD-E301388; DTNSRDC/CMLD-84/06) Avail: NTIS HC A07/MF A01 CSCL 09/2

This report is a functional description and user's guide to the interactive Signal and Pattern Analysis and Recognition Systems (ISPARS). ISPARS is a loosely integrated interactive graphics software system, installed on a PDP11/45 computer system, for processing sampled signal waveforms and determining the pattern classes into which waveforms may be separated. ISPARS capabilities for signal analysis include segmentation, spectral decomposition, transformation (filtering), normalization, and characterization of signals. Signal analysis is viewed as a means of eliminating redundant information in the signal and thus extracting significant features. These features form the input to the pattern analysis procedure which permits the construction of algorithms for clustering and classifying feature strings. ISPARS affords the user a convenient, flexible means of visualizing and exploring a sampled data stream by employing interactive displays of complex transformations, easy parameter modification, convenient data stream control, and a simple, concise command language. Author (GRA)

N84-29515# Naval Research Lab., Washington, D. C.
A COMPARATIVE STUDY OF LINEAR ARRAY SYNTHESIS TECHNIQUE USING A PERSONAL COMPUTER
S. R. Laxpati, J. P. Shelton, and M. A. Burns 29 May 1984 25 p
(AF Proj. F12141)
(AD-A141444; NRL-MR-5336) Avail: NTIS HC A02/MF A01 CSCL 09/2

Five computer programs for synthesizing low-sidelobe sum patterns from linear arrays are evaluated in terms of run time and precision. Three of the programs are based on the Dolph-Chebyshevb synthesis procedure, in which all sidelobes are set at the same level. The other two programs are based on a discretized version of the Taylor synthesis procedure, in which far-out sidelobes are allowed to decay. The programs were written for use on small 8- and 16-bit personal computers. It was found that the fastest running programs are also the most precise. The only Chebyshev program that gave satisfactory precision for arrays as large as 100 elements is based on Breseler's nested product algorithm, and the only similarly acceptable Taylor program is based on Shelton's discretized synthesis. Author (GRA)

N84-29516# Ohio State Univ., Columbus.
A STUDY OF THE APPLICATION OF SOFTWARE METRICS TO COBOL
N. C. Debnath and S. H. Zweben Jul. 1983 153 p
(Contract DAAG29-80-K-0061)
(AD-A141467; OSU-CISRC-TR-84-3; ARO-17150.5-EL) Avail: NTIS HC A08/MF A01 CSCL 09/2

This report presents the results of a study of software metrics applied to various classes of COBOL programs. Particular attention is given to the software science metrics of Halstead, which were applied to hundreds of COBOL programs written by students at Ohio State University, as well as several production COBOL programs. The results include support of the inclusion of Data Division in the software science counting strategy, nonsupport for the use of the software science language level metric, and the identification of a weakness in the ability of the Halstead E measure to capture integration effort. Several proposed complexity metrics were compared for their ability to predict actual development effort, with none of the metrics studied behaving in an impressive manner. Some approaches for refining existing complexity metrics to overcome their apparent weaknesses are suggested. GRA

N84-29517# Aerospace Corp., El Segundo, Calif. Guidance and Control Div.
LCAP2 (LINEAR CONTROL ANALYSIS PROGRAM). VOLUME 1: BATCH LCAP2 USER'S GUIDE Final Report
E. A. Lee 15 Nov. 1983 180 p
(Contract F04701-83-C-0084)
(AD-A141486; SD-TR-84-06-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 09/2

The computer program LCAP2 (Linear Controls Analysis Program) provides the analyst with the capability to numerically perform classical linear control analysis techniques such as transfer function manipulation, transfer function evaluation, frequency response, root locus, time response and sampled-data transforms. It is able to deal with continuous and sampled-data systems, including multiloop multirate digital systems, using s, z and w transforms. Primary considerations in the development of this program were ease of use and computational accuracy. Transfer function and polynomial arrays are defined to be referenced with indices so that they may be easily addressed by the operators. The combination of this set of LCAP2 operators and the form of the data structure provides a very flexible and easy to use program. Since each LCAP2 operator is coded as a FORTRAN subroutine, the batch version of LCAP2 allows the user to easily develop code to automate, for example, a complete stability analysis task beginning with the input of raw data to the generation of the stability plots. An interactive version of LCAP2 is also available. The LCAP2 report is organized in three volumes: batch user's guide (I), interactive user's guide (II), and source code description (III). Author (GRA)

N84-29518# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
SOFTWARE SUPPORT FOR FULLY DISTRIBUTED/LOOSELY COUPLED PROCESSING SYSTEMS, VOLUME 1 Final Technical Report, 20 Aug. 1981 - 31 Dec. 1982
P. H. Jr. Enslow, N. J. Livesey, R. J. LeBlanc, and M. S. McKendry Griffiss AFB, N.Y. RADC Jan. 1984 145 p
(Contract F30602-81-C-0249; AF Proj. R244)
(AD-A141500; GIT-ICS-82/16-Vol-1; RADC-TR-83-238-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 09/2

The development and operation of very loosely-coupled distributed processing systems presents several new challenges. These Challenges, or differences from the techniques applicable to centralized systems, result primarily from the environment that is involved - a multiplicity of logical and physical resources that are very loosely coupled, a highly distributed and decentralized control system, and the autonomous and asynchronous operation of the various components. This report identifies the system support capabilities necessary to support the design, analysis, implementation, operation, utilization, and management of fully distributed, loosely-coupled, data processing systems. These system support capabilities are divided into three categories - software development support tools, distributed system design facilities, and operational support capabilities. Selected support capabilities are described, together with the rationale for the services that they will provide. Estimates are presented for the resources and facilities required to design and implement selected support capabilities. Also provided is a development priority for the support capabilities. Author (GRA)

N84-29519# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
SOFTWARE SUPPORT FOR FULLY DISTRIBUTED/LOOSELY COUPLED PROCESSING SYSTEMS. VOLUME 2: APPENDIX-SELECTED PAPERS Final Technical Report, 20 Aug. 1981 - 31 Dec. 1982
P. H. Jr. Enslow, N. J. Livesey, R. J. LeBlanc, and M. S. McKendry Griffiss AFB, N.Y. RADC Jan. 1984 215 p
(Contract F30602-81-C-0249; AF Proj. R244)
(AD-A141501; GIT-ICS-82/16-Vol-2; RADC-TR-83-238-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 09/2

The development and operation of very loosely-coupled distributed processing systems presents several new challenges. These challenges, or differences from the techniques applicable to centralized systems, result primarily from the environment that is involved - a multiplicity of logical and physical resources that are very loosely coupled, a highly distributed and decentralized

control system, and the autonomous and asynchronous operation of the various components. This report identifies the system support capabilities necessary to support the design, analysis, implementation, operation, utilization, and management of fully distributed, loosely-coupled, data processing systems. These system support capabilities are divided into three categories - software development support tools, distributed system design facilities, and operational support capabilities. Selected support capabilities are described, together with the rationale for the services that they will provide. Estimates are presented for the resources and facilities required to design and implement selected support capabilities. Also provided is a development priority for the support capabilities. An appendix contains several papers providing in-depth discussions of various support capabilities and their features. Author (GRA)

N84-29520# Naval Research Lab., Washington, D. C.
PROGRAM PREGA PIVOTAL REGRESSION ANALYSIS OF GAMMA-RAY SPECTRA FROM NAI(T1) DETECTORS FOR THE ND6620 COMPUTER Final Report
G. W. Phillips and B. G. Glagola 6 Apr. 1984 192 p
(R0113)
(AD-A141539; AD-E000564; NRL-MR-5275) Avail: NTIS HC A09/MF A01 CSCL 09/2

Program PREGA was developed at NRL to perform a fast and efficient regression analysis of a gamma ray spectrum from an unknown source, taken with a NaI(T1) detector. The analysis determines the best subset from a library of standard spectra to use in fitting the data. Output at each step includes relative intensities and uncertainties for each standard used in the fit, plus the partial F statistic for significance of each library element. Final output includes an analysis of variance (ANOVA) table, distribution of residuals, location of largest residuals, distribution of runs of consecutive residuals with the same sign, and the location of largest runs. The program was written for the Nuclear Data ND6620 computer and has been transferred to VAX II/780. GRA

N84-29521# Navy Personnel Research and Development Center, San Diego, Calif.
MICROCOMPUTER NETWORK FOR COMPUTERIZED ADAPTIVE TESTING (CAT): PROGRAM LISTING. SUPPLEMENT
B. Quan, T. A. Park, G. Sandahl, and J. H. Wolfe Mar. 1984 396 p
(AD-A141569; NPRDC-TR-84-33-SUPPL) Avail: NTIS HC A17/MF A01 CSCL 09/2

This document lists several computer programs pertaining to computerized adaptive testing. GRA

N84-29522# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics/Logistics Dept.
PROGRAM DESCRIPTIONS FOR INTERACTIVE SIGNAL AND PATTERN ANALYSIS AND RECOGNITION SYSTEM (ISPARS) Interim Report, Sep. 1979 - Sep. 1980
W. Parsons, J. Garner, J. Carlberg, and S. Berkowitz Mar. 1984 141 p
(SR01403)
(AD-A141575; DTNSRDC/CMLD-84/05) Avail: NTIS HC A07/MF A01 CSCL 09/2

The Interactive Signal and Pattern Analysis and Recognition System (ISPARS) is an integrated package of interactive graphics software and signal and pattern analysis programs for visualizing and exploring sampled data streams and designing pattern logics. This report contains detailed descriptions of the subroutines, files, and linking procedures for the ISPARS components developed at the David Taylor Naval Ship Research and Development Center (DTNSRDC) which are not documented in other DTNSRDC reports. Author (GRA)

N84-29523# Naval Ocean Systems Center, San Diego, Calif.
KERNEL Ada PROGRAMMING SUPPORT ENVIRONMENT (KAPSE) INTERFACE TEAM, PUBLIC REPORT, VOLUME 3 Interim Report, 28 Oct. 1982 - 30 Jun. 1983
P. Oberndorf 25 Oct. 1983 496 p
(AD-A141576; NOSC/TD-552-Vol-3) Avail: NTIS HC A21/MF A01 CSCL 09/2

The continuing activities of the Kernel Ada Programming Support Environments (KAPSE) interface team and its industry/academia auxiliary are reported. (Ada is a recent, DOD-developed programming language.) The Ada Joint Program Office (AJPO)-sponsored effort will ensured the interoperability and transportability of tools and data bases among different KAPSE implementations. The effort is the result of a Memorandum of Agreement (MOA) among the three services directing the establishment of an evaluation team, chaired by the Navy, to identify and establish KAPSE interface standards. As with previous Ada-related developments, the widest possible participation is being encouraged to create a broad base of experience and acceptance in industry, academia, and the DOD. Author (GRA)

N84-29524# Stanford Univ., Calif. Dept. of Computer Science.
SORTING BY RECURSIVE PARTITIONING
D. M. Chapiro Dec. 1983 32 p
(Contracts MDA903-83-C-0335; F49620-79-C-0137; Grant NSF MCS-83-00984)
(AD-A141583; SU-STAN-CS-83-994) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document presents a new O(n lg lg n) time sort algorithm that is more robust than O(n) distribution sorting algorithms. The algorithm uses a recursive partition-concatenate approach, partitioning each set into a variable number of subsets using information gathered dynamically during execution. Sequences are partitioned using statistical information computed during the sort for each sequence. Space complexity is O(n) and is independent from the order and distribution of the data. If the data is originally in a list, only O(square root of (n) extra space is necessary. The algorithm is insensitive to the initial ordering of the data, and it is much less sensitive to the distribution of the values of the sorting keys than distribution sorting algorithms. Its worst-case time is O(n lg lg n) across all distributions that satisfy a new fractalness criterion. This condition, which is sufficient but not necessary, is satisfied by any set with bounded length keys and bounded repetition of each key. If this condition is not satisfied, its worst case performance degrades gracefully to O(n lg n). In practice, this occurs when the density of the distribution over omega(n) of the keys is a fractal curve (for sets of numbers whose values are bounded), or when the distribution has very heavy tails with arbitrarily long keys (for sets of numbers whose precision is bounded). In some preliminary tests, it was faster than Quicksort for sets of more than 150 elements. The algorithm is practical, works basically in place, can be easily implemented and is particularly well suited both for parallel processing and for external sorting. Author (GRA)

N84-29525# Martin Marietta Aerospace, Denver, Colo.
SREM (SOFTWARE REQUIREMENTS ENGINEERING METHODOLOGY) EVALUATION, VOLUME 1 Final Technical Report, 1 Oct. 1980 - 15 Nov. 1983
A. Stone, D. Hartschuh, and B. Castor Griffiss AFB, N.Y. RADC Feb. 1984 101 p
(Contract F30602-80-C-0272; AF Proj. 5581)
(AD-A141631; MCR-83-553-Vol-1; RADC-TR-83-314-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 09/2

In the fall of 1980, the Rome Air Development Center contracted Martin Marietta Denver Aerospace to perform a comprehensive evaluation of the Software Requirements Engineering Methodology (SREM). The objectives of the evaluation were to assess the capabilities of SREM for specifying the software requirements of large, embedded computer systems and to recommend improvements which would enhance its effectiveness. Specific evaluation criteria were developed to judge the effectiveness of the methodology, support tools and user training. The approach included attending a SREM training course and using SREM to specify the software requirements for two Air Force systems. In general, it was found that the SREM was an effective vehicle for specifying and analyzing the software requirements of large embedded computer systems, especially descriptions of real

world objects, data requirements and message processing. However, deficiencies were noted in the specification language, particularly in describing parallel and distributed processing requirements, in the friendliness of the user interfaces to the analysis (consistency/completeness) and simulation tools, in the performance of these tools and in the effectiveness of the training. Appropriate improvements to all of the functional deficiencies are recommended. GRA

N84-29526# Martin Marietta Aerospace, Denver, Colo.
SREM (SOFTWARE REQUIREMENTS ENGINEERING METHODOLOGY) EVALUATION. VOLUME 2: SPECIFICATIONS AND TECHNICAL DATA Final Technical Report, 1 Oct. 1980 - 15 Nov. 1983
A. Stone, D. Hartschuh, and B. Castor Griffiss AFB, N.Y. RADC Feb. 1984 580 p
(Contract F30602-80-C-0272; AF Proj. 5581)
(AD-A141632; MCR-83-553-Vol-2; RADC-TR-83-314-Vol-2) Avail: NTIS HC A25/MF A01 CSCL 09/2

In the fall of 1980, the Rome Air Development Center contracted Martin Marietta Denver Aerospace to perform a comprehensive evaluation of the Software Requirements Engineering Methodology (SREM). The objectives of the evaluation were to assess the capabilities of SREM for specifying the software requirements of large, embedded computer systems and to recommend improvements which would enhance its effectiveness. Specific evaluation criteria were developed to judge the effectiveness of the methodology, support tools and user training. The approach included attending a SREM training course and using SREM to specify the software requirements for two Air Force systems. In general, it was found that the SREM was an effective vehicle for specifying and analyzing the software requirements of large embedded computer systems, especially descriptions of real work objects, data requirements and message processing. However, deficiencies were noted in the specification language, particularly in describing parallel and distributed processing requirements, in the friendliness of the user interfaces to the analysis (consistency/completeness) and simulation tools, in the performance of these tools and in the effectiveness of the training. Appropriate improvements to all of the functional deficiencies are recommended. GRA

N84-29527# Army Engineer Topographic Labs., Wright-Patterson AFB, Ohio.
ANALYSIS OF INTERACTIVE IMAGE CLEANSING VIA RASTER-PROCESSING TECHNIQUES
N. J. Friend Nov. 1983 31 p
(DA Proj. 4A7-62707-A-855)
(AD-A141772; ETL-0347) Avail: NTIS HC A03/MF A01 CSCL 09/2

An analysis of an interactive image-cleansing program, RASTER, is presented. RASTER is utilized for cleansing binary imagery in a fast and effective manner via nine programed functions, which are herein described and illustrated.Author (GRA)

N84-29528# Naval Biodynamics Lab., New Orleans, La.
ERROR IN CALSPAN 3-DIMENSIONAL CRASH VEHICLE SIMULATION COMPUTER PROGRAM FOR THE CASE OF MASSLESS SEGMENTS
M. R. Seemann Dec. 1983 9 p
(AF Proj. M0097PN)
(AD-A141783; AD-E750818; NBDL-83R013) Avail: NTIS HC A02/MF A01 CSCL 09/2

An error was recently discovered in the CALSPAN 3-dimensional Crash Vehicle Simulation (3DCVS) computer program which causes gross errors in the results when massless segments are used. Additionally even after the error had been corrected, unacceptable computational errors were evident in the 3DCVS output results when a massless segment was used. The sources of the errors were investigated and the significant findings and recommendations resulting form this investigation are presented in this report in order to make this information available to other CALSPAN 3DCVS users. Author (GRA)

N84-29529# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
SPECIFICATION AND IMPLEMENTATION OF ATOMIC DATA TYPES Ph.D. Thesis
W. E. Weihl Mar. 1984 150 p
(Contracts N00014-75-C-0661; N00014-83-K-0125; Grants NSF MCS-79-23769; NSF MCS-82-03486)
(AD-A141823; MIT/LCS/TR-314) Avail: NTIS HC A07/MF A01 CSCL 09/2

Maintaining the consistency of long lived, on-line data is a difficult task, particularly in a distributed system. It explores an approach in which atomicity is ensured by the data objects shared by concurrent activities; such objects are called atomic objects, and data types whose objects are atomic are called atomic types. This dissertation addresses three fundamental questions: what is an atomic type? how can an atomic type be specified? how can an atomic type be implemented? Atomicity of activities is a global property of an entire system, while atomicity of types is a local property of individual types. The definitions of atomicity discussed encompass both serializability and recoverability, and use user supplied specifications of objects to permit greater concurrency. The specification of a data type divides into two parts: the serial specification, which describes how the type behaves in the absence of concurrency and failures, and the behavioral specification, which describes how the type supports atomicity. Several implementations of atomic types are presented illustrating how existing techniques for synchronization and recovery can be extended to use information about the behavior of objects to increase concurrency. GRA

N84-29530# Naval Postgraduate School, Monterey, Calif.
A TUTORIAL FOR THE RAMTEK 9460 RASTER GRAPHICS SYSTEM AND THE di-3000 GRAPHICS PACKAGE M.S. Thesis
R. H. Elmlinger Mar. 1984 89 p
(AD-A141834) Avail: NTIS HC A05/MF A01 CSCL 09/2

This document is a tutorial for programming with the DI-3000 graphics software package, Ramtek 9460 graphics hardware, and VAX 11/780 computer located in the Naval Postgraduate School's Wargaming Analysis and Research Laboratory. For first time users, an introductory level explanation of the functions and terminology associated with the graphics package is presented. This document can also serve as a departure point for programmers who wish to make more extensive use of available capabilities. Author (GRA)

N84-29531# Softech, Inc., Waltham, Mass.
INTRODUCTION TO Ada, A HIGHER ORDER LANGUAGE. L103 TEACHER'S GUIDE
May 1984 262 p
(Contract DAAB07-83-C-K514)
(AD-A141848) Avail: NTIS HC A12/MF A01 CSCL 09/2

This guide aims to assist instructors who present courses in the Ada programming language. GRA

N84-29532# Softech, Inc., Waltham, Mass.
Ada (REGISTERED TRADEMARK) TECHNICAL OVERVIEW. L102 TEACHER'S GUIDE
May 1984 260 p
(Contract DAAB07-83-C-K514)
(AD-A141862) Avail: NTIS HC A12/MF A01 CSCL 05/9

An introduction to the Ada computer programming language is given. A summary of Ada program features is provided. The Ada and FORTRAN languages were compared. R.S.F.

N84-29533# Purdue Univ., Lafayette, Ind. School of Forestry.
PURDUE PLANE STRUCTURES ANALYZER 2: A COMPUTERIZED WOOD ENGINEERING SYSTEM, 1983 VERSION Forest Service General Technical Report
Stanley K. Suddarth and Ronald W. Wolfe (Forest Products Lab., Madison, Wisc.) May 1984 41 p
(AD-A142042; FSGTR-FPL-40) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Purdue Plane Structures Analyzer (PPSA) is a computer program developed specifically for the analysis of wood structures.

It uses recognized analysis procedures, in conjunction with recommendations of the 1982 National Design Specification for Wood Construction, to determine stresses and deflections of wood trusses and frames. The program offers several options for the analysis of member capacity, depending on lateral support conditions, strength property variations, and critical load assumptions. Tabulated output provides a summary report of the input analog as well as individual member and total structure responses to assumed load conditions. Program operation requires knowledge of material properties, member connections, boundary conditions, and loads. The user also must have a knowledge of structural analysis to interpret the output. This report provides guidelines for program use and interpretation of results and will be helpful to structural engineers and designers. Author (GRA)

N84-29534# Advanced Information and Decision Systems, Mountain View, Calif.
AN INFORMAL STUDY OF PROGRAM COMPREHENSION Annual Technical Report, 1 Jun. 1982 - 31 May 1983
E. A. Domeshek, D. G. Shapiro, J. S. Dean, and B. P. McCune Mar. 1984 63 p
(Contract F49620-81-C-0067)
(AD-A142224; AI/DS-TM-1014-3; AFOSR-84-0309TR; ATR-2) Avail: NTIS HC A04/MF A01 CSCL 12/1

This report describes work performed during the second year of research on a Program Reference Language. During this year, a study was conducted in which protocols of programmers studying a new program (with the intent of debugging it) were analyzed, both for the vocabulary used and for indications of strategies adopted in their efforts at program comprehension. A sampling of programmers' natural vocabulary for referencing programs was gathered and analyzed. Preliminary steps were taken towards using this data as the basis for the design of a formal query language for the PRL. The study also raised some new issues bearing on the implementation systems which use the PRL: individual differences imply the need for customization; context-sensitive information management is important; and useful user interface features were identified. Author (GRA)

N84-29535# Stanford Univ., Calif. Computer Systems Lab.
RUNTIME DETECTION AND DESCRIPTION OF DEADNESS ERRORS IN Ada TASKING
D. Helmbold and D. C. Luckham Nov. 1983 62 p
(Contract N00039-82-C-0250; Grant AF-AFOSR-0355-83)
(AD-A142239; TR-83-249; AFOSR-84-0464TR; Rept-22) Avail: NTIS HC A04/MF A01 CSCL 09/2

A runtime monitoring system for detecting and describing tasking errors in Ada programs is presented. Basic concepts for classifying tasking errors, called deadness errors, are defined. These concepts indicate which aspects of an Ada computation must be monitored in order to detect deadness errors resulting from attempts to rendezvous or terminate. They also provide a basis for the definition and proof of correct detection. Descriptions of deadness errors are given in terms of the basic concepts. The monitoring system has two parts: (1) a separately compiled runtime monitor that is added to any Ada source text to be monitored, and (2) a pre-processor that transforms the Ada source text so that necessary descriptive data is communicated to the monitor at runtime. Some basic preprocessing transformations and an abstract monitoring for a limited class of errors were previously presented. GRA

N84-29536# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
MORPHOLOGICAL SKELETON REPRESENTATION AND CODING OF BINARY IMAGES
P. A. Maragos and R. W. Schafer 1984 5 p Presented at the Intern. Conf. on Acoustics, Speech and Signal Process.
(Contract DAAG29-81-K-0024; AF Proj. 230-4)
(AD-A142250; AFOSR-84-0347TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper presents a preliminary study on using Mathematical Morphology to represent and code a binary or a grey-tone image by parts of its skeleton, a thinned version of the image. An image can be uniquely decomposed into skeleton, a thinned version of the image. An image can be uniquely decomposed into skeleton components, and then reconstructed by dilating these components. Since, for a certain category of imagery, the skeleton components possess a lower entropy than the original image, a run-length or entropy coding scheme can be used to achieve representation or transmission of the image at a lower information rate than originally required. Author (GRA)

N84-29537# Department of the Navy, Washington, D. C.
CIG DISTORTION CORRECTION WITH DELAY LINES Patent Application
D. R. Breglia and B. W. Patz, inventors (to Navy) Filed 2 Apr. 1984 15 p
(AD-D011025; US-Patent-Appl-SN-595876) Avail: NTIS HC A02/MF A01 CSCL 09/2

In general, this invention relates to distortion in wide angle display systems and in particular to wide angle display systems wherein the display is generated by a RASTER scan performed by a modulated laser. More particularly, this invention relates to a means for correcting pixel distortion occurring in theta mapped displays such as those presented by wide angle projectors driven by computer image generation. GRA

N84-29538# California Univ., Livermore. Lawrence Livermore Lab.
DOE WORKSHOP ON COMPUTER-AIDED ENGINEERING: ABSTRACTS
13 Oct. 1983 57 p refs Presented at 3rd DOE Workshop on Computer-Aided Engr., Livermore, Calif., 13 Oct. 1983
(Contract W-7405-eng-48)
(DE84-001064; CONF-831060-Absts) Avail: NTIS HC A04/MF A01

The needs, activities, and plans for Computer Aided Engineering (CAE) within the DOE laboratories and major DOE contractors are investigated. The intent is to provide a forum for exchange of information and ideas, and to foster CAE communications among DOE Laboratories and contractors. Each of the workshop subject areas is abstracted. These areas are CAE overview, Networking and Data Transfer, Integrated Circuits, Engineering Systems, Mechanical CAE and Systems, CAE Workstations and Tools, and Drafting and PCB Layouts. DOE

N84-29539# Fermi National Accelerator Lab., Batavia, Ill.
SIMULATION PROGRAM FOR CENTRAL HELIUM LIQUEFIER
S. Kawamura 20 Feb. 1984 23 p refs
(Contract DE-AC02-76CH-03000)
(DE84-009866; FERMILAB/TM-1245) Avail: NTIS HC A02/MF A01

The computer program described here analyzes the performance of Fermilab Central Helium Liquefier (CHL) and predicts the values of the plant thermodynamic variables at all process points in the plant. To simulate CHL, this program is modified from the prototype program which was developed by Hitachi Ltd. a couple of years ago. This program takes care of only the steady state simulation and takes account of the change of the turbine efficiency, the pressure drops and the UA values of the heat exchangers. How to use the program is shown. DOE

N84-29540# Los Alamos Scientific Lab., N. Mex.
COMPUTER GRAPHICS SUPPORT SERVICE
D. O. Dickman 1984 13 p refs Presented at the 6th Ann. Ideas in Sci. and Eng. Exposition and Symp., Albuquerque, N.Mex., 2 May 1984
(Contract W-7405-eng-36)
(DE84-010001; LA-UR-84-1120; CONF-8405131-2) Avail: NTIS HC A02/MF A01

Computer graphics can be an integral part of a graphics support service. This presentation discusses several types of computer graphics software and hardware and how computer graphics are integrated into a graphics support service. Various computer graphics software packages will be discussed, and several types

of output will be presented. The terminals and cameras use, such as a high resolution color graphics terminal and a multi-image camera, are discussed as is the use of various types of film.
Author

N84-29541# Lanchester Polytechnic, Coventry (England).
PARAMETERIZATION AND SHAPE OF B-SPLINE CURVES FOR CAD
P. J. Hartley and C. J. Judd 1983 16 p refs
Avail: NTIS HC A02/MF A01

It is shown that Bezier-type B-spline curves cannot be given an arc length parameterization. In view of this, two ways of choosing knots were discussed: an iterative method and a simple formula. The formula, used in ab initio design, is useful when applied to interpolating B-spline curves; when the B-spline nodes are used as parameter values, good shape and good parameterization are achieved. Author (ESA)

N84-29292# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
A DATA MANAGEMENT SYSTEM FOR DIGITAL RASTER MAPS [EIN DATENVERWALTUNGSSYSTEM FUER RASTERKARTEN]
Wigand Weber *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 91 1983 p 77-95 refs In GERMAN; ENGLISH and FRENCH summary (For primary document see N84-29286 19-43)
Avail: NTIS HC A05/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N84-29542*# Hawaii Univ., Honolulu. Dept. of Electrical Engineering.
REED SOLOMON CODES FOR ERROR CONTROL IN BYTE ORGANIZED COMPUTER MEMORY SYSTEMS Final Report
Shu Lin and Daniel J. Costello, Jr. Jul. 1984 35 p
(Grant NAG2-202)
(NASA-CR-173803; NAS 1.26:173803) Avail: NTIS HC A03/MF A01 CSCL 09B

A problem in designing semiconductor memories is to provide some measure of error control without requiring excessive coding overhead or decoding time. In LSI and VLSI technology, memories are often organized on a multiple bit (or byte) per chip basis. For example, some 256K-bit DRAM's are organized in 32Kx8 bit-bytes. Byte oriented codes such as Reed Solomon (RS) codes can provide efficient low overhead error control for such memories. However, the standard iterative algorithm for decoding RS codes is too slow for these applications. Some special decoding techniques for extended single-and-double-error-correcting RS codes which are capable of high speed operation are presented. These techniques are designed to find the error locations and the error values directly from the syndrome without having to use the iterative algorithm to find the error locator polynomial. Author

N84-29543*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOLUTION OF A TRIDIAGONAL SYSTEM OF EQUATIONS ON THE FINITE ELEMENT MACHINE
Susan W. Bostic Mar. 1984 24 p refs
(NASA-TM-85710; NAS 1.15:85710) Avail: NTIS HC A02/MF A01 CSCL 09B

Two parallel algorithms for the solution of tridiagonal systems of equations were implemented on the Finite Element Machine. The Accelerated Parallel Gauss method, an iterative method, and the Buneman algorithm, a direct method, are discussed and execution statistics are presented. Author

N84-29544*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STUDY OF THE MAPPING OF NAVIER-STOKES ALGORITHMS ONTO MULTIPLE-INSTRUCTION/MULTIPLE-DATA-STREAM COMPUTERS
D. Scott Eberhardt, Donald Baganoff (Stanford Univ., Calif.), and Ken Stevens Jul. 1984 26 p refs
(NASA-TM-85945; A-9716; NAS 1.15:85945) Avail: NTIS HC A03/MF A01 CSCL 09B

Implicit approximate-factored algorithms have certain properties that are suitable for parallel processing. A particular computational fluid dynamics (CFD) code, using this algorithm, is mapped onto a multiple-instruction/multiple-data-stream (MIMD) computer architecture. An explanation of this mapping procedure is presented, as well as some of the difficulties encountered when trying to run the code concurrently. Timing results are given for runs on the Ames Research Center's MIMD test facility which consists of two VAX 11/780's with a common MA780 multi-ported memory. Speedups exceeding 1.9 for characteristic CFD runs were indicated by the timing results. Author

N84-29545*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MANAGEMENT OF CAD/CAM INFORMATION: KEY TO IMPROVED MANUFACTURING PRODUCTIVITY
Robert E. Fulton and Jack Brainin Jul. 1984 26 p refs Sponsored in part by Navy
(NASA-TM-86255; NAS 1.15:86255) Avail: NTIS HC A02/MF A01 CSCL 09B

A key element to improved industry productivity is effective management of CAD/CAM information. To stimulate advancements in this area, a joint NASA/Navy/industry project designated Intergrated Programs for Aerospace-Vehicle Design (IPAD) is underway with the goal of raising aerospace industry productivity through advancement of technology to integrate and manage information involved in the design and manufacturing process. The project complements traditional NASA/DOD research to develop aerospace design technology and the Air Force's Integrated Computer-Aided Manufacturing (ICAM) program to advance CAM technology. IPAD research is guided by an Industry Technical Advisory Board (ITAB) composed of over 100 representatives from aerospace and computer companies. Author

N84-29546# California Univ., Livermore. Lawrence Livermore Lab.
NLTSS OVERVIEW
Pierre J. DuBois 8 Nov. 1983 6 p
(Contract W-7405-eng-48)
(DE84-008536; UCID-20035) Avail: NTIS HC A02/MF A01

The LTSS operating system supports multi-programming, time-sharing, interactive computing, automated batch computing, limited interprocess communication, multiple independent simultaneously executing job streams for a single user (all streams accessible from the same terminal), and the ability for a process to create, load, and start another process. Such processes may subsequently communicate freely with each other. The interprocesses communication logic is most commonly used when independent job streams wish to communicate. DOE

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N84-29547# Carnegie-Mellon Univ., Pittsburgh, Pa. Robotics Inst.
A MACHINE LEARNING APPROACH TO STUDENT MODELING Annual Report, Nov. 1982 - Nov. 1983
P. Langley, S. Ohlsson, and S. Sage 1 May 1984 41 p
(Contract N00014-83-K-0074)
(AD-A141704; CMU-RI-TR-84-7; TR-1) Avail: NTIS HC A03/MF A01 CSCL 06/4

The notion of buggy procedures has played an important role in recent cognitive models of mathematical skills. The authors

review some earlier work on student modeling, in which Artificial Intelligence methods have been used to automatically construct buggy models of student behavior. They then propose an alternate approach to student modeling that draws on insights from the rapidly developing field of machine learning, and describe ACN, a student modeling system that incorporates this approach. This system begins with a set of overly general rules, which it uses to search a problem space until it arrives at the same answer as the student. The ACM computer program then uses the solution path it has discovered to determine positive and negative instances of its initial rules, and employs a discrimination learning mechanism to place additional conditions on these rules. The revised rules will reproduce the solution path without search, and constitute a cognitive model of the student's behavior. The authors examine ACM's operation in the domain of multi-column subtraction problems, and propose some extensions that should be included in future versions of the system. Finally, they discuss the generality, psychological validity, and practical utility of this approach to student modeling. Author (GRA)

N84-29548# BDM Corp., McLean, Va.
STRATEGIC COMPUTING AND SURVIVABILITY RESEARCH Quarterly Technical Report, No. 1, 28 Nov. 1983 - 25 Mar. 1984
K. D. Tatalias, R. F. Dundervill, B. G. Kushner, and D. L. Porter 10 Apr. 1984 8 p
(Contract MDA903-84-C-0059; ARPA Order 4959)
(AD-A141717) Avail: NTIS HC A02/MF A01 CSCL 09/2

To meet the challenge of certain critical problems in defense, the Defense Advanced Research Projects Agency (DARPA) has initiated an important new program in strategic computing. By seizing an opportunity to leverage recent advances in artificial intelligence, computer science, and microelectronics, the Agency plans to create a new generation of machine intelligence technology. This new technology will have unprecedented capabilities and promises to greatly increase our national security and our economic strength as it emerges during the coming decade. Within the past few years, important advances have occurred in many separated areas of artificial intelligence, computer science, and microelectronics. Advances in expert system technology now enable the mechanization of the practical knowledge and the reasoning methods of human experts in many fields. Advances in machine vision, speech, and machine understanding of natural language provide easy ways for humans to interact with computers. New methods of microsystem design and implementation enable the rapid transfer of new architectural concepts into state-of-the-art microelectronics. GRA

N84-29549# Systems Control, Inc., Palo Alto, Calif.
ADAPTIVE DECENTRALIZED CONTROL Annual Report, Jun. 1982 - Jul. 1983
B. Friedlander Apr. 1984 70 p
(Contract F49620-81-C-0051)
(AD-A142160; Rept-5400-02; AFOSR-84-0453TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

This annual report summarizes some preliminary results of a research effort directed towards the development of adaptive decentralized control systems. The adaptive controller in such a system must operate in the presence of unmodeled dynamics. An input-output approach is presented for analyzing the global stability and robustness properties of adaptive controllers under such circumstances. Conditions for guaranteeing global stability of the error system associated with the adaptive controller, and ensuring boundedness of the adaptive gains, are derived. Specific bounds are presented for certain signals in the control systems. Author (GRA)

N84-29550# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Operations Research and System.
OVERLOAD CONTROL FOR A STORED PROGRAM CONTROL (SPC) TELEPHONE EXCHANGE: AN OPTIMAL STOCHASTIC CONTROL APPROACH
J. H. vanSchuppen Jan. 1984 14 p refs Submitted for publication.
(CWI-OS-R8404; B8467337) Avail: NTIS HC A02/MF A01

The processor load of a stored program control telephone exchange is modelled as a hierarchical queueing system while the problem of overload control is formulated as an optimal stochastic control problem. The latter problem is solved. An implementation of the derived control law is suggested. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N84-29551# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technol.
PROBLEMS OF CONSTITUTIVE MODELING AND STABILITY OF DISSIPATIVE BODIES [ZAGADNIENIA MODELOWANIA KONSTYTUTWNEGO I STABILNOSCI CIAL DYS-SYPATYWNYCH]
Kurt Frischmuth 1982 61 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

A modified theory of constitutive modeling with internal parameters was proposed, and its thermodynamic characteristics were discussed. This modified approach to the concept of a mechanical process eliminates some of the undesirable features of spatial topology. Analysis of the evolution of states in the course of relaxation processes provides implicit confirmation of the previously proposed identity of states of equilibrium with respect to regularity of the function of evolution. The reduction of thermodynamic irregularity, entropy flow, and the stability of the state of equilibrium of a body were considered. Analysis of stability in the sense of continuous dependence of solutions on initial conditions of field equations was based on Dafermos' and Kosinski's theory of thermodynamics and on use of a coupled system as an illustration. The conclusion of the review were compared with Rice's study on shear stability in plastic materials with diffusive transport of state parameters. Author

N84-29552# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technol.
ASYMPTOTIC SOLUTIONS OF DISPERSIVE QUASI-LINEAR EQUATIONS [ROZWIAZANIA ASYMPTOTYCZNE ROWNAN QUASI-LINIOWYCH DYSPERSYWNYCH]
Wiodzimierz Laprus 1982 17 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

Asymptotic solutions of differential equations and their applications are discussed. Formal application of the expansion of a progressive wave to system of partial, first-order, dispersive quasi-linear equations leads to transport equations that define expansion coefficients. Both the expansion of a progressive wave and this system of equations contain the large parameter p. It is shown that the expansion of a progressive wave has an asymptotic character when p approaches infinity. The general resolution of the first transport equation is found in reducing assumptions. Several examples illustrate the difficulty of applying the theory of electromagnetic waves to known equations in mathematical physics. M.G.

N84-29553# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technol.
COMPARISON OF THE LIAPUNOV METHOD AND THE METHOD OF TOTAL DISPARITIES USING THE EXAMPLE OF SELECTED DIFFERENTIAL EQUATIONS [POROWNANIE METOD LAPUNOWA I NIEROWNOSCI SUMARYCZNYCH NA PRZYKLADZIE WYBRANYCH ROWNAN ROZNICOWYCH]
Krzystof Gajewski 1982 24 p
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

Two methods of analyzing the stability of solutions of differential equations are compared. Liapunov's direct method is based on

use of the Liapunov mathematical function to estimate the region of stability. The so-called total disparities method involves examination of equivalent global equations using altered constants. Mathematical proofs illustrate the use of the Liapunov method and the method of total disparities. It is concluded that use of the Liapunov function yields much better results. M.G.

N84-29554 British Library Lending Div., Boston Spa (England).
FINDING THE ROOTS OF THE TRANSCENDENTAL EQUATIONS IN THE PROBLEM OF DETERMINING THE THERMAL CONDUCTIVITY OF A PLATE UNDER HETEROGENEOUS BOUNDARY CONDITIONS
A. D. Gorbunov and E. M. Goldfarb 26 Apr. 1984 9 p refs Transl. into ENGLISH from Izv. (USSR) p 104-108
(BLL-M-35602-(5828.4)) Avail: British Library Lending Div., Boston Spa, Engl.

Transcendental equations are given for determining the roots of equations for the temperatures of metal being heated and the gas heating it. The roots of the transcendental equations are determined. These greatly simplify the calculation of the temperature fields for heating by direct flow or counterflow. The method of solution can be applied to other cases of heating. Author

N84-29555# Polish Academy of Sciences, Warsaw.
PRESENT-DAY PROBLEMS IN IDENTIFICATION OF DYNAMIC SYSTEMS: A REVIEW
Jerzy Wicher 1984 35 p refs
(ISSN-0208-5658) Avail: NTIS HC A03/MF A01

The problems connected with identification procedures which can be treated as a step in model building theory are examined. The concepts of parameter identification, computational techniques for nonlinear systems, and output error in the construction of a model are investigated. M.A.C.

N84-29556*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN EFFICIENT APPROXIMATE FACTORIZATION IMPLICIT SCHEME FOR THE EQUATIONS OF GASDYNAMICS
Timothy J. Barth (Informatics General Corp.) and Joseph L. Steger Jun. 1984 35 p refs
(NASA-TM-85957; A-9744; NAS 1.15:85957) Avail: NTIS HC A03/MF A01 CSCL 12A

An efficient implicit finite-difference algorithm for the gas dynamic equations utilizing matrix reduction techniques is presented. A significant reduction in arithmetic operations is achieved while maintaining the same favorable stability characteristics and generality found in the Beam and Warming approximate factorization algorithm. Steady-state solutions to the conservative Euler equations in generalized coordinates are obtained for transonic flows about a NACA 0012 airfoil. The theoretical extension of the matrix reduction technique to the full Navier-Stokes equations in Cartesian coordinates is presented in detail. Linear stability, using a Fourier stability analysis, is demonstrated and discussed for the one-dimensional Euler equations. It is shown that the method offers advantages over the conventional Beam and Warming scheme and can retrofit existing Beam and Warming codes with minimal effort. M.G.

N84-29557*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A MODIFIED LEAST SQUARES FORMULATION FOR A SYSTEM OF FIRST ORDER EQUATIONS Final Report
Mohamed M. Hafez (Computer Dynamics, Inc., Virginia Beach, Va.) and Timothy N. Phillips May 1984 22 p refs
(Contracts NAS1-17070; NAS1-17175)
(NASA-CR-172372; ICASE-84-16; NAS 1.26:172372) Avail: NTIS HC A02/MF A01 CSCL 12A

Second order equations in terms of auxiliary variables similar to potential and stream functions are obtained by applying a weighted least squares formulation to a first order system. The additional boundary conditions which are necessary to solve the higher order equations are determined and numerical results are presented for the Cauchy-Riemann equations. Author

N84-29558*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONJUGATE GRADIENT COUPLED WITH MULTIGRID FOR AN INDEFINITE PROBLEM Final Report
J. Gozani (Tel-Aviv Univ.), A. Nachshon (Tel-Aviv Univ.), and E. Turkel (Tel-Aviv Univ.) Jun. 1984 14 p
(Contract NAS1-17130)
(NASA-CR-172379; ICASE-84-18; NAS 1.26:172379) Avail: NTIS HC A02/MF A01 CSCL 12A

An iterative algorithm for the Helmholtz equation is presented. This scheme was based on the preconditioned conjugate gradient method for the normal equations. The preconditioning is one cycle of a multigrid method for the discrete Laplacian. The smoothing algorithm is red-black Gauss-Seidel and is constructed so it is a symmetric operator. The total number of iterations needed by the algorithm is independent of h. By varying the number of grids, the number of iterations depends only weakly on k when k(3)h(2) is constant. Comparisons with a SSOR preconditioner are presented. Author

N84-29559*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TVD FINITE DIFFERENCE SCHEMES AND ARTIFICIAL VISCOSITY Final Report
Stephen F. Davis Jun. 1984 38 p refs
(Contract NAS1-17070)
(NASA-CR-172373; ICASE-84-20; NAS 1.26:172373) Avail: NTIS HC A03/MF A01 CSCL 12A

The total variation diminishing (TVD) finite difference scheme can be interpreted as a Lax-Wendroff scheme plus an upwind weighted artificial dissipation term. If a particular flux limiter is chosen and the requirement for upwind weighting is removed, an artificial dissipation term which is based on the theory of TVD schemes is obtained which does not contain any problem dependent parameters and which can be added to existing MacCormack method codes. Numerical experiments to examine the performance of this new method are discussed. M.A.C.

N84-29560*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPECTRAL METHODS FOR EXTERIOR ELLIPTIC PROBLEMS Final Report
C. Canuto (CNR, Pavia, Italy), S. I. Hariharan, and L. Lustman (Systems and Applied Sciences Corp., Hampton, Va.) Jun. 1984 35 p refs
(Contracts NAS1-17070; NAS1-17130)
(NASA-CR-172380; ICASE-84-21; NAS 1.26:172380) Avail: NTIS HC A03/MF A01 CSCL 12A

Spectral approximations for exterior elliptic problems in two dimensions are discussed. As in the conventional finite difference or finite element methods, the accuracy of the numerical solutions is limited by the order of the numerical farfield conditions. A spectral boundary treatment is introduced at infinity which is compatible with the infinite order interior spectral scheme. Computational results are presented to demonstrate the spectral accuracy attainable. Although a simple Laplace problem is examined, the analysis covers more complex and general cases. M.A.C.

N84-29561*# California Univ., Los Angeles. School of Engineering and Applied Science.
TWO-DIMENSIONAL SPLINES
Florencio I. Utreras (Texas A and M Univ., College Station) Jul. 1984 59 p refs Presented in a Lecture given at UCLA, Los Angeles, 28 Jun. - 12 Jul. 1984
(Grants NsG-4015; AF-AFOSR-0318-83)
(NASA-CR-173804; NAS 1.26:173804; UCLA-ENG-84-21) Avail: NTIS HC A04/MF A01 CSCL 12A

Noteworthy properties of one-dimensional splines are presented. Stochastic processes, kernel functions, interpolation, and data smoothing were discussed. Theorems and concomitant proofs are provided. R.S.F.

N84-29562*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ESTIMATION OF COEFFICIENTS AND BOUNDARY PARAMETERS IN HYPERBOLIC SYSTEMS Final Report
H. Thomas Banks and Katherine A. Murphy Jun. 1984 54 p refs
(Contracts NAS1-16394; NAS1-17130; DAAG-29-83-K0029; Grants NSF MCS-82-05355; AF-AFOSR-0198-81)
(NASA-CR-172389; ICASE-84-24; NAS 1.26:172389) Avail: NTIS HC A04/MF A01 CSCL 12A

Semi-discrete Galerkin approximation schemes are considered in connection with inverse problems for the estimation of spatially varying coefficients and boundary condition parameters in second order hyperbolic systems typical of those arising in 1-D surface seismic problems. Spline based algorithms are proposed for which theoretical convergence results along with a representative sample of numerical findings are given. M.G.

N84-29563# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
APPLICATIONS OF THE VARIATIONAL INTEGRAL IN ITERATIVE NUMERICAL SOLUTIONS TO THE STATIONARY HEAT EQUATIONS M.S. Thesis
Mark L. MacDonald Mar. 1984 96 p
(AD-A141091; AFIT/GNE/ENP/84M-11) Avail: NTIS HC A05/MF A01 CSCL 12/1

Three stationary heat equations were solved using the finite-difference method. The resulting set of algebraic equations were solved using the Gauss-Seidel iterative technique. The temperatures at the nodal points were substituted into a numerical approximation of the variational integral. The variational integral approximation was used to determine when to stop the iterative process. The variational integral stopping criterion was compared to a stopping criterion that uses the displacement between iterations to approximate the error between the iterative solution and the exact solution. The variational integral was found to be less effective as a stopping criterion than the error estimate. The variational integral was examined as a method of determining whether the finite-difference technique or the finite-element technique gave a more accurate solution. It was found that the variational integral failed, in some cases, to predict the more accurate method. Author (GRA)

N84-29564# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SPECIAL NONLINEAR OPTIMIZATION TECHNIQUES M.S. Thesis
Ali M. Ragab Dec. 1983 101 p
(AD-A141097; AFIT/MA/GOR/83D-5) Avail: NTIS HC A06/MF A01 CSCL 12/1

This thesis extends the work of Leighton and Jones which takes functions that satisfy special types of differential equations and determines an interval on which the functions either have zeros or attain bounded values. Theorems for locating zeros are proved for functions of a single variable and functions of several variables with illustrative examples. The applications of matrix equations to constrained optimization problems are described. An algorithm for random search technique for the general optimization problem is presented with a FORTRAN V program and test problems. Author (GRA)

N84-29565# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN OPTICALLY IMPLEMENTED KALMAN FILTER ALGORITHM M.S. Thesis
W. A. Roemer Dec. 1983 147 p
(AD-A141126; AFIT/GEO/EE/84M-2) Avail: NTIS HC A07/MF A01 CSCL 12/1

An extended Kalman filter algorithm which incorporates an enhanced correlator/linear measurement model and a nonlinear target acceleration dynamics model is described for use in a pointing and tracking system for high-energy ground-based laser weaponry. The measurement model used in the filter combines the computational benefits of a correlation algorithm with the statistical accuracy available from a Kalman filter. The dynamics model, based on a constant turn-rate target acceleration model, is deemed to be a better representation of the true target dynamics than a linear first-order Gauss-Markov target acceleration model for the cases of interest. Optical processing techniques are completely specified for the correlation stage to perform the required correlation in real time, and the filter stage to perform the linear algebra required for the Kalman filter. This extensive use of optics allows the development of two tracking algorithms based on the same models: a FLIR-constrained tracker with a 30 Hz frame rate and an unconstrained tracker with a 100 Hz frame rate using real-time sensors in place of the FLIR.
Author (GRA)

N84-29566# Texas Univ., Austin. Austin Center for Cybernetic Studies.
A METHOD FOR CONSTRUCTING A UNIMODAL INFERENTIAL OR PRIOR DISTRIBUTION Research Report
P. Brockett, A. Charnes, and K. Paick Jan. 1984 16 p
(Contracts N00014-81-C-0236; N00014-82-K-0295)
(AD-A141389; CCS-RR-473) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper shows how to take personally assessed information and use it to develop a continuous unimodal prior density function, perhaps for subsequent Bayesian analysis. The method is completely nonparametric and uses only the furnished information and no other. The technique is easily computerized, and yields a closed analytical formula for the prior. The resulting distribution may be considered to be an inferential distribution. Author (GRA)

N84-29567# Texas Univ., Austin. Austin Center for Cybernetic Studies.
A LIMIT THEOREM ON CHARACTERISTIC FUNCTIONS VIA AN EXTREMAL PRINCIPLE
A. Ben-Tal (Technion-Israel Inst. of Tech., Haifa) Dec. 1983 9 p
(Contract N00014-81-C-0236; Grant NSF ECS-82-14081)
(AD-A141390; CCS-RR-477) Avail: NTIS HC A02/MF A01 CSCL 12/1

The author proves a classical limit theorem on characteristic functions by using duality between a pair of optimization problems, one of which is an infinite dimensional minimization involving the relative entropy functional. Author (GRA)

N84-29568# North Carolina Univ., Chapel Hill. Dept. of Statistics.
RANDOM RAYS, GEOMETRIC ACOUSTICS, AND THE PARABOLIC WAVE EQUATION
T. Dankel, Jr. Mar. 1984 26 p
(Contract N00014-81-K-0373)
(AD-A141398; LAP-4) Avail: NTIS HC A03/MF A01 CSCL 12/1

A theory of random rays, based on the stochastic mechanical interpretation of the parabolic wave equation, is proposed. The relation of these rays to those of geometric acoustics is discussed. The Feynman-Kac formula is used to represent the acoustic wave field as a Wiener integral, and it is shown that this representation agrees with the Markov approximation in a simple case.
Author (GRA)

N84-29569# North Carolina Univ., Chapel Hill. Chapel Hill Dept. of Statistics.
CAPACITY OF GENERALIZED MISMATCHED GAUSSIAN CHANNELS Technical Report
C. R. Baker Jan. 1984 20 p
(Contracts N00014-75-C-0491; N00014-81-K-0373)
(AD-A141399; LAP-2) Avail: NTIS HC A02/MF A01 CSCL 09/4

Information capacity is determined for a Gaussian communication channel when the constraint is given in terms of a covariance which is different from that of the channel noise. GRA

N84-29570# North Carolina Univ., Chapel Hill. Dept. of Statistics.
A NOTE ON AVERAGE MUTUAL INFORMATION FOR SPHERICALLY INVARIANT PROCESSES
A. F. Gualtierotti Mar. 1984 15 p
(Contract N00014-81-K-0373)
(AD-A141401; LAP-5) Avail: NTIS HC A02/MF A01 CSCL 12/1

Mutual information is considered for communication channels where the noise process is spherically invariant. An expression is obtained for noise processes having a mixing measure with finite support. Author (GRA)

N84-29571# Pittsburgh Univ., Pa. Inst. for Computational Mathematics and Applications.
ERROR ESTIMATES FOR NON-LINEAR FINITE ELEMENT COMPUTATIONS
W. C. Rheinboldt 1984 25 p
(Contract N00014-80-C-0455)
(AD-A141404; ICMA-84-69) Avail: NTIS HC A02/MF A01 CSCL 12/1

In recent years, increasing interest has centered on the development of reliable and computationally inexpensive a posteriori error estimates for finite element computations. Such estimates can provide some, often critically important, information about the accuracy and reliability of the computed solution as a model of the behavior of the physical phenomena under study. At the same time it has become widely accepted that these estimates also constitute a basic tool in the construction of efficient adaptive finite element processes which are designed to achieve a desired error tolerance at minimal cost or a best possible solution within an allowable cost range, Up to now most of this work concerned linear problems. In particular, such problems usually involve a number of intrinsic parameters and because of the non-linear nature interest centers rarely on the determination of a few specific solutions for fixed parameter values but instead on a more general study of these solutions under various changes of the parameters. This paper presents a new approach to the construction of a posteriori error estimates for non-linear problems which is highly effective and at the same time computationally rather inexpensive. GRA

N84-29572# Federal Aviation Administration, Washington, D.C. Office of Environment and Energy.
AREA EQUIVALENT METHOD VISICALC (TRADE NAME). USERS' GUIDE
T. L. Connor and D. N. Fortescue Feb. 1984 34 p
(AD-A141430; FAA-EE-84-8) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document contains instructions to execute the Area Equivalent Method (AEM). The AEM requires the VISICALC software package and an Apple IIe personal computer or a calculator. The Area Equivalent Method is a mathematical process to calculate Day Night Average Sound Level contour area. The AEM is easy to use and is intended as a screening procedure to determine the need for an airport Environmental Impact Statement. Author (GRA)

N84-29573# Naval Underwater Systems Center, New London, Conn.
DETECTION OF RANDOMLY OCCURING SIGNALS USING SPECTRA AND FREQUENCY DOMAIN KURTOSIS ESTIMATES
R. F. Dwyer 23 Mar. 1984 58 p
(AD-A141461; NUSC-TM-841057) Avail: NTIS HC A04/MF A01 CSCL 12/1

Several detection statistics are compared in the frequency domain based on the asymptotic probability of detection criterion. These include, second-order, fourth-order, and two forms of kurtosis estimates. The results show that for randomly occurring signals or non-Gaussian signals, the fourth-order and kurtosis estimates can have higher asymptotic probability of detection levels compared with second-order estimates. But, only for the kurtosis estimates do the results seem significant. Moreover, if a second-order estimate of the noise is available to normalize a fourth-order estimate of signal and noise, the resultant modified kurtosis estimate has higher asymptotic probability of detection levels even for Gaussian signals. This result only holds when there is a significant positive covariance between the numerator and the normalizing noise sample in the denominator. On the other hand, if an independent noise sample is used to normalize a second-order or fourth-order estimate the overall performance based on the asymptotic probability of detection will be degraded compared with the unnormalized second-order or fourth-order estimates, respectively. This result could impact current sonar processing methods. Author (GRA)

N84-29574# Wisconsin Univ., Madison. Mathematics Research Center.
ON PAIRS OF POSITIVE SOLUTIONS FOR A CLASS OF SEMILINEAR ELLIPTIC PROBLEMS Technical Summary Report
D. G. DeFigueiredo and P. L. Lions Mar. 1984 28 p
(Contract DAAG29-80-C-0041)
(AD-A141504; MSR-TSR-2660) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper the author discuss the Dirichlet problem -delta u = f(u) in omega, u greater than O in omega, u = O on curly d omega under the hypotheses of sublinearity at O and superlinearity at + infinity. The dominating theme throughout the paper is that of a supersolution of (1). They prove theorems on the existence of two solutions whenever problem (1) possesses a supersolution, using topological degree arguments or variational methods according to the type of growth of f at + infinity. Also treated are questions of existence of supersolutions and their actual construction. Schwarz symmetrization techniques are used to obtain supersolutions from solutions of associated symmetrized problems. Author (GRA)

N84-29575# Wisconsin Univ., Madison.
GWILYM JENKINS: EXPERIMENTAL DESIGN AND TIME SERIES Technical Summary Report
G. E. P. Box Apr. 1984 26 p
(Contract DAAG29-80-C-0041)
(AD-A141506; MSR-TSR-2676) Avail: NTIS HC A03/MF A01 CSCL 12/1

The work of the late Gwilym Jenkins is discussed. The course of the joint work by Box and Jenkins is traced beginning with investigation of a problem in experimental design for continuous optimization of a changing process. This led to studies of discrete dynamic models and control problems and finally to work on time series and forecasting. Author (GRA)

N84-29576# Wisconsin Univ., Madison.
THE CAUCHY PROBLEM IN ONE-DIMENSIONAL NONLINEAR VISCOELASTICITY Technical Summary Report
W. J. Hrusa and J. A. Nohel Mar. 1984 30 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A141507; MSR-TSR-2658) Avail: NTIS HC A03/MF A01 CSCL 12/1

The authors study the initial value problem for a nonlinear hyperbolic Volterra equation which models the motion of an unbounded viscoelastic bar. Under physically motivated assumptions, we establish the existence of a unique, globally defined, classical solution provided the initial data are sufficiently smooth and small. They also discuss boundedness and asymptotic behavior. Their analysis is based on energy estimates in conjunctcion with properties of strongly positive definite kernels. Author (GRA)

N84-29577# Wisconsin Univ., Madison. Mathematics Research Center.
A NOTE ON EQUALITY IN ANDERSON'S THEOREM Technical Summary Report
A. P. Soms Feb. 1984 10 p
(Contract DAAG29-80-C-0041)
(AD-A141509; MSR-TSR-2648) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this note it is shown, by a counterexample, that the necessary and sufficient condition for equality in Anderson's theorem, given by Anderson (1955), is incorrect. A more general condition is given which is shown to be necessary and sufficient. This is applied to the multivariate normal distribution. Author (GRA)

N84-29578# Columbia Univ., New York. Dept. of Mathematics.
NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS AND RELATED PROBLEMS OF PADE APPROXIMATIONS Progress Report, 30 Jun. 1982 - 29 Jun. 1983
D. V. Chudnovsky and G. V. Chudnovsky Dec. 1983 15 p
(Grant AF-AFOSR-0190-81; AF Proj. 2304)
(AD-A141519; AFOSR-84-0291TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During the period of the grant the investigators continued their studies of one-four dimensional classical and quantum lattice and continuous completely integrable systems. Their technique is based on the method of Backlund transformations and their algebraic, geometric and arithmetic properties. Methods of Backlund transformations were successfully used in the study of Pade approximations. One of the significant achievements during the last year was the solution of the key problem on the almost perfectness of Pade approximations to solutions of linear differential equations. Author (GRA)

N84-29579# Stanford Univ., Calif. Dept. of Computer Science.
ON THE EQUIVALENCE OF LOGICAL DATABASES
G. M. Kuper, J. D. Ullman, and M. Y. Vardi 1984 9 p
(Grant AF-AFOSR-0212-80; AF Proj. 2304)
(AD-A141541; AFOSR-84-0360TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The investigators suggest a new approach to database updates, in which a database is treated as a collection of theories. They investigate two issues: (1) equivalence of databases under update operations, (2) simultaneous multiple update operations. Author (GRA)

N84-29580# California Univ., Los Angeles. Dept. of Physics.
DYNAMICAL PROPERTIES OF DISORDERED SYSTEMS Final Report
R. L. Orbach, C. Kennel, and A. Cinderella 21 May 1984 36 p
(Contract N00014-75-C-0245)
(AD-A141597) Avail: NTIS HC A03/MF A01 CSCL 12/1

This final report covers the most recent period of the Office of Navy Research Contract titled Dynamic Properties of Disordered Systems. During this period, research has been completed on a variety of research problems contained in this ONR Research Proposal. The principal areas of research can be summarized under the following categories: (1) The fractal interpretation of amorphous structures; (2) Non-linear conductivity of low dimensional materials; (3) The effect of anodization on the superconducting transition temperature; (4) The time dependence of the remanent magnetization of spin glasses; and (5) The experimental opportunities for physics at high magnetic fields. GRA

N84-29581# Wisconsin Univ., Madison. Mathematics Research Center.
A MAXIMUM PRINCIPLE FOR AN ELLIPTIC SYSTEM AND APPLICATIONS TO SEMILINEAR PROBLEMS Technical Summary Report
D. G. deFigueiredo and E. Mitidieri Mar. 1984 27 p
(Contract DAAG29-80-C-0041)
(AD-A141600; MRC-TSR-2653) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document studied a Dirichlet problem in a bounded region for elliptic systems. For the question of existence of positive solutions the key ingredient is a maximum principle for a linear elliptic system associated with (*). A priori bounds for the solutions of (*) are proved under various types of growth conditions on f. Variational methods are used to establish the existence of pairs of solutions for (*). GRA

N84-29582# Wisconsin Univ., Madison. Mathematics Research Center.
L INFINITY STABILITY OF AN EXPONENTIALLY DECREASING SOLUTION OF THE PROBLEM DELTA u + f(x,u) = o IN r(n) Technical Summary Report
H. Matano Apr. 1984 22 p
(Contract DAAG29-80-C-0041)
(AD-A141601; MRC-TSR-2678) Avail: NTIS HC A02/MF A01 CSCL 12/1

The equations studied here arise in many fields of mathematical sciences such as population dynamics in mathematical ecology, population genetics, chemical reaction theory, etc. This study concerns the stability of equilibrium solutions of these equations. Among the solutions of nonlinear evolution equations, the practically important ones are those which are stable in a certain sense. However, finding a stable equilibrium solution is in many cases considerably more difficult than just proving the existence of equilibrium solutions. This paper gives a useful sufficient condition for the existence of stable equilibrium solutions. Result presented in this paper is a generalization of the author's former results on equations in bounded domains. However, the equations considered here (which are in the whole space R sub n) exhibit much more complicated dynamical behavior, and therefore only a few results have been known about the existence of stable equilibrium solutions. The objective of this paper is to make a systematic study of these equations and to give rather a general theorem on the existence of stable equilibrium solutions. GRA

N84-29583# Wisconsin Univ., Madison. Mathematics Research Center.
A GEOMETRIC PROOF OF TOTAL POSITIVITY FOR SPLINE INTERPOLATION Technical Summary Report
C. deBoor and R. DeVore Apr. 1984 14 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-81-01661)
(AD-A141606; MRC-TSR-2677) Avail: NTIS HC A02/MF A01 CSCL 12/1

The total positivity of the spline collocation matrix is the basis of several important results in univariate spline theory. This makes it desirable to provide as simple as possible a proof of this total positivity. The proofs available in the literature don't qualify since these all rely on certain determinant identities which are not exactly intuitive. The authors give a proof that uses nothing more than Cramer's rule (hard to avoid since total positivity is a statement about determinants) and the geometrically obvious fact that a B-spline can always be written as a positive combination of B-splines on a finer knot sequence. The geometric intuition appealed to here stems from the area of Computer-Aided Design in which a spline is constructed and manipulated through its B-polygon, a broken line whose vertices correspond to the B-spline coefficients. If a knot is added (to provide greater potential flexibility), the new B-polygon is obtained by interpolation to the old. This had led Lane and Riesenfeld to a proof of the variation diminishing property of the spline collocation matrix and is shown here to provide a proof of the total positivity as well. GRA

N84-29584# Wisconsin Univ., Madison. Mathematics Research Center.
GLOBAL EXISTENCE OF CLASSICAL SOLUTIONS TO THE EQUATIONS OF MOTION FOR MATERIALS WITH FADING MEMORY Technical Summary Report
W. J. Hrusa Feb. 1984 19 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A141607; MRC-TSR-2652) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document discussed global existence and decay of classical solutions to the equations of motion for a class of nonlinear materials with fading memory. The existence theorem presented here is an improved version of a previous result of the author. This paper corresponds to a talk given at the Conference on Physical Mathematics and Nonlinear Partial Differential Equations held at West Virginia University during July 1983. Author (GRA)

N84-29585# Wisconsin Univ., Madison. Mathematics Research Center.
A FREE BOUNDARY PROBLEM FOR DEGENERATE QUASI-LINEAR PARABOLIC EQUATIONS Technical Summary Report
Z. Wu Mar. 1984 27 p
(Contract DAAG29-80-C-0041)
(AD-A141608; MRC-TSR-2656) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper is concerned with a free boundary problem which arises in the study of a class of degenerate parabolic equations. A thorough treatment is given for a special case which can be reduced to a problem in ordinary differential equations upon introduction of the appropriate similarity variable. Beyond its inherent interest, the solvability of the resulting problem establishes that an analysis by Vol'pert and Hudjaev of jump conditions satisfied by solutions of degenerate parabolic equations is not correct in general. Author (GRA)

N84-29586# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE RANGE OF A REGENERATIVE SEQUENCE Technical Summary Report
P. W. Glynn Mar. 1984 16 p
(Contract DAAG29-80-C-0041)
(AD-A141652; MRC-TSR-2661) Avail: NTIS HC A02/MF A01 CSCL 12/1

Consider a system which evolves randomly in time; the trajectory of such a system traces a path through space. If one partitions space into a disjoint collection of subsets, one can study the number of subsets visited by the trajectory up to a certain instant. This paper shows that, under certain conditions, the number of subsets never grows linearly in time, regardless of the partition used. On the other hand, the precise order of growth (which can be arbitrarily close to linear order) does depend on the way in which space is partitioned. These results are obtained for regenerative random processes. Such processes describe systems which, when viewed on a certain random time scale, evolve in an independent and identically distributed fashion. Virtually any ergodic discrete-time Markov chain has this property. GRA

N84-29587# Wisconsin Univ., Madison. Mathematics Research Center.
A DIRECT APPROACH TO THE VILLARCEAU CIRCLES OF A TORUS Technical Summary Report
I. J. Schoenberg Mar. 1984 13 p
(Contract DAAG29-80-C-0041)
(AD-A141653; MRC-TSR-2651) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let T and T' be two tori which are linked like the two consecutive elements of a chain. Moreover the author assumes that T and T' have central circles of equal radii. By central circle of a torus he means the locus of the center of the sphere of constant radius which envelopes the torus. It is shown that the linked tori can be so placed that they are tangent to each other along simple closed curve gamma which is not a circle. In this mutually tangent position there is no gap between the two tori T and T'. It is shown that the above property is equivalent to the (slanting) circles of a torus discovered by Yvon Villarceau in 1848. GRA

N84-29588# Wisconsin Univ., Madison. Mathematics Research Center.
CLOSED GEODESICS FOR THE JACOBI METRIC AND PERIODIC SOLUTIONS OF PRESCRIBED ENERGY OF NATURAL HAMILTONIAN SYSTEMS Technical Summary Report
V. Benci Mar. 1984 17 p
(Contract DAAG29-80-C-0041)
(AD-A141654; MRC-TSR-2655) Avail: NTIS HC A02/MF A01 CSCL 12/1

Questions of existence of periodic solutions for classical mechanical systems have a long history. The development of the nonlinear functional analysis has provided powerful new tools and renewed interest in these problems. This paper considers the Hamiltonian system under certain circumstances. GRA

N84-29589# Wisconsin Univ., Madison.
MULTIPLE LIMIT POINT BIFURCATION FOR FREDHOLM OPERATORS OF NON-ZERO INDEX Technical Summary Report
R. R. Huilgol Mar. 1984 13 p
(Contract DAAG29-80-C-0041)
(AD-A141660; MRC-TSR-2662) Avail: NTIS HC A02/MF A01 CSCL 12/1

Using the method of embedding a given equation into a higher dimensional problem, examples of multiple limit point solutions emanating from a single limit point are constructed within the context of algebraic and ordinary differential equations. In both instances, the linearized problem around the limit point is assumed to lead to non-self-adjoint operators. Author (GRA)

N84-29590# Wisconsin Univ., Madison. Mathematics Research Center.
USE OF SIMULTANEOUS AUTOREGRESSIVE MODELS IN BALANCED INCOMPLETE BLOCK AND LATTICE SQUARE DESIGNS Technical Summary Report
N. R. Draper and D. Faraggi Feb. 1984 28 p
(Contract DAAG29-80-C-0041)
(AD-A141661; MRC-TSR-2650) Avail: NTIS HC A03/MF A01 CSCL 12/1

Simultaneous autoregressive models are applied to balance incomplete block and lattice square designs. Relationships between the resulting maximum likelihood estimators and standard analyses are explored and clarified. Also, it is shown that the Papadakis estimator, as applied to these designs, has the characteristics of the standard analyses, but simply involves fewer plots in the adjustment procedure for treatment averages. A worked example illustrates the differences in treatment estimates in a lattice square design, for standard inter-block analysis and for simultaneous autoregressive assumptions. Author (GRA)

N84-29591# Naval Ship Research and Development Center, Bethesda, Md. Central Inst. Dept.
EXTREME VALUE ESTIMATES FOR ARBITRARY BANDWIDTH GAUSSIAN PROCESSES USING THE ANALYTIC ENVELOPE
R. D. Pierce Mar. 1984 75 p
(AD-A141685; DTNSRDC/CID-84/1) Avail: NTIS HC A04/MF A01 CSCL 12/1

A procedure is presented for the estimation of extreme values of stationary Gaussian random processes with arbitrary bandwidths. This approach is based on the analytic envelope defined by the Hilbert Transform; this envelope is Rayleigh distributed regardless of bandwidth. For experimentally derived data that has been converted into digital flow, the Hilbert Transform is approximated using algorithms implemented on a digital computer to produce samples of the envelope's time history. Next, the degree of correlation between these envelope samples is taken into account using a method developed from simulation studies of a series of synthetic Gaussian time histories with varying bandwidths. Once this correlation effect has been estimated, the standard methods of order statistics are applied to these samples using the Rayleigh probability density function. Examples of applying this procedure to experimentally derived data are presented. Author (GRA)

N84-29592# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
ALGORITHMS FOR ZONAL METHODS AND DEVELOPMENT OF THREE DIMENSIONAL MESH GENERATION PROCEDURES Final Report, Sep. 1980 - Aug. 1983
J. L. Steger Wright-Patterson AFB, Ohio AFWAL Feb. 1984 97 p
(Contract F33615-81-K-3020; AF Proj. 2307)
(AD-A141692; AFWAL-TR-83-3129) Avail: NTIS HC A05/MF A01 CSCL 12/1

The goal of this research was to further develop zonal methods and three dimensional procedures for application of

finite difference methods to solve complex aircraft configurations. For the task of three dimensional grid generation both elliptic and hyperbolic methods were developed. A chimera grid scheme, that is, the use of overset multiple grid systems, was also tested in two dimensions. In zonal methods several new algorithms were developed. These included combining transonic potential codes with thin layer Navier-Stokes equations, unsteady transonic potential, Euler and vector potential codes. This report summarizes the various numerical algorithms that were studied. Author (GRA)

N84-29593# Wisconsin Univ., Madison. Center for Mathematics Research.
A REMARK ON SEMILINEAR PERTURBATIONS OF ABSTRACT PARABOLIC EQUATIONS
M. G. Crandall Apr. 1984 12 p
(Contract DAAG29-80-C-0041)
(AD-A141695; MRC-TSR-2673) Avail: NTIS HC A02/MF A01 CSCL 12/1

Abstract results are given which apply to semilinear parabolic equations. Simple examples are provided by initial-value problems for semilinear equation like u sub t = delta u + f(u). As applied to this situation, the results show that for suitable f and t greater than 0 the solution u(t,phi) of the problem with the initial-value phi varies continuously together with its space derivatives as phi varied in a weaker sense - e.g. small perturbations of phi in some L sub P-norms cause small changes in u(t,phi) in the space on continuously differentiable functions. Author (GRA)

N84-29594# Wisconsin Univ., Madison.
SIMPLE BOUNDS FOR SOLUTIONS OF MONOTONE COMPLEMENTARITY PROBLEMS AND CONVEX PROGRAMS
O. L. Mangasarian and L. McLinden Mar. 1984 17 p
(Contract DAAG29-80-C-0041; Grants NSF MCS-82-00632; NSF MCS-81-02684)
(AD-A141699; MRC-TSR-2665) Avail: NTIS HC A02/MF A01 CSCL 12/1

For a solvable monotone complementarity problem it is shown that each feasible point which is not a solution of the problem provides simple numerical bounds for some or all components of all solution vectors. Consequently for a solvable differentiable convex program each primal-dual feasible point which is not optimal provides simple numerical bounds for some or all components of all primal-dual solution vectors. Also given is existence result and simple bounds for solutions of monotone complementarity problems satisfying a new, distributed constraint qualification. This result carries over to a simple existence and boundedness result for differentiable convex programs satisfying a new, distributed constraint qualification. Author (GRA)

N84-29595# Wisconsin Univ., Madison.
ON A CLASS OF QUASILINEAR PARTIAL INTEGRODIFFERENTIAL EQUATIONS WITH SINGULAR KERNELS
W. J. Hrusa and M. Renardy Apr. 1984 33 p
(Contract DAAG29-80-C-0041; Grants NSF MCS-82-10950; NSF MCS-82-15064)
(AD-A141700; MRC-TSR-2667) Avail: NTIS HC A03/MF A01 CSCL 12/1

In a recent paper, Dafermos and Nohel considered a model equation for nonlinear viscoelasticity. They proved that smooth solutions exist locally in time and also globally in time for small data. For large data, globally defined smooth solutions will not exist in general, and formation of shocks is expected. In the analysis of Dafermos and Nohel, and in other papers showing related results, it is essential that the viscoelastic memory function is absolutely continuous. There are, however, some indications, on both a theoretical and an experimental basis, that certain viscoelastic materials may be adequately described by models with singular memory functions. The mathematical existence properties for such models should in fact be better than for regular memory functions, since a singular memory function precludes the formation of shocks. However, the methods used in previous existence proofs cannot be generalized to singular kernels. In this paper, its authors provide an existence theory for such models. They approximate the equation by equations with regular kernels, for which existence is known. They then use energy estimates to show that these approximate solutions converge to a limit. GRA

N84-29596# Wisconsin Univ., Madison. Mathematics Research Center.
MORSE THEORY FOR SYMMETRIC FUNCTIONALS ON THE SPHERE AND AN APPLICATION TO A BIFURCATION PROBLEM Technical Summary Report
V. Benci and F. Pacella Apr. 1984 22 p
(Contract DAAG29-80-C-0041)
(AD-A141709; MRC-TSR-2668) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper uses Conley's index to study the cortical points of a function f on a finite dimensional sphere in presence of a symmetry group. The authors prove a theorem which leads to a lower bound on the number of critical points of f when the group is finite, even if the action is not free. This investigation has been motivated by the following bifurcation problem Au = lambda, where A is a variational G-equivariant operator. An estimate on the number of branches bifurcating from an eigenvalue of A'(0) is given.
Author (GRA)

N84-29597# Wisconsin Univ., Madison. Mathematics Research Center.
THE EFFECT OF AGGREGATION IN NONLINEAR REGRESSION Technical Summary Report
M. L. Goldberg Apr. 1984 41 p
(Contract DAAG29-80-C-0041)
(AD-A141728; MRC-TSR-2669) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is often convenient to apply a nonlinear model developed for a single unit to data representing the average response for several units. The relationship between the parameters of the aggregate model and those of the individual units is investigated in a geometrical framework, for a general nonlinear model. The aggregation effect derived is closely related to the bias in nonlinear estimation, as given by Box. Unlike the bias, however, the aggregation effect may be of comparable magnitude to the standard error of the estimates. The theoretical results derived are verified empirically in an application to a model of residential energy consumption. Author (GRA)

N84-29598# Wisconsin Univ., Madison. Mathematics Research Center.
ANALYSIS OF AN INTEGRATION METHOD FOR RAPIDLY OSCILLATING INTEGRANDS Technical Summary Report
D. Levin, L. Reichel, and C. Ringhofer Apr. 1984 16 p
(Contract DAAG29-80-C-0041)
(AD-A141731; MRC-TSR-2670) Avail: NTIS HC A02/MF A01 CSCL 12/1

A collocation method for evaluating integrals of rapidly oscillating functions is analyzed. The method is based on the approximation of the antiderivative of the integrand as the solution of an ordinary differential equation via polynomial collocation. Numerical examples are presented. Author (GRA)

N84-29599# Wisconsin Univ., Madison. Mathematics Research Center.
LOCAL LINEAR INDEPENDENCE OF THE TRANSLATES OF A BOX SPLINE Technical Summary Report
R. Q. Jia Apr. 1984 17 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-10950)
(AD-A141749; MRC-TSR-2671) Avail: NTIS HC A02/MF A01 CSCL 12/1

In early 1970's, the finite element analysts were interested in the space spanned by certain translates of one element. Recently, with the appearance of box splines, people are interested in the space spanned by certain translates of one box spline. Such a space was proved useful in certain approximation problems. This report studies some properties of this space. GRA

N84-29600# Ford Aerospace and Communications Corp., Palo Alto, Calif.
ON FAILURE MODELING
A. J. Lemoine and M. L. Wenocur 1 Feb. 1984 17 p
(Contract N00014-82-C-0620)
(AD-A141760; WDL-TR10147) Avail: NTIS HC A02/MF A01 CSCL 12/1

A promising approach to failure modeling, in particular to developing failure-time distributions, is discussed. Under this approach, system state or wear and tear is modeled by an approximately chosen random process, e.g., a diffusion process; and the occurrences of fatal shocks are modeled by a Poisson process whose rate function is state dependent. The system is said to fail when either wear and tear accumulates beyond an acceptable or safe level or a fatal shock occurs. This approach has significant merit. First it provides revealing new insights into most of the famous and frequently used lifetime distributions in reliability theory. Moreover, it suggests intuitively appealing ways for enhancing those standard models. Indeed, this approach provides a means of representing the underlying dynamics inherent in failure processes. Reasonable postulates for the dynamics of failure should lend credence to prediction and estimation of reliability, maintainability, and availability. In other words, accuracy of representation could lead to better, more reliable prediction of failure. Author (GRA)

N84-29601# Texas Univ., Austin. Center for Cybernetic Studies.
PARETO-OPTIMALITY, EFFICIENCY ANALYSIS AND EMPIRICAL PRODUCTION FUNCTIONS
A. Charnes, W. W. Cooper, B. Golany, L. Seiford, and J. Stutz May 1983 25 p
(Contracts F49642-82-C-0129; MDA903-81-C-0365)
(AD-A141768; CCS-459) Avail: NTIS HC A02/MF A01 CSCL 12/1

The construction and analysis of Pareto-optimal frontier production functions by a new Data Envelopment Analysis method is developed in the context of new theoretical characterizations of the inherent structure and capabilities of such empirical production functions. Contrasts and connections with other developments, including solutions of some remaining problems, are made re aspects such as informatics, economies of scale, isotonicity and non-concavity, discretionary and nondiscretionary inputs, piecewise linearity, partial derivatives and Cobb-Douglas properties of the functions. Non-Archimedean constructs are not required. Author (GRA)

N84-29602# Yale Univ., New Haven, Conn. Dept. of Computer Science.
LOCAL UNIFORM MESH REFINEMENT WITH MOVING GRIDS
W. D. Gropp Apr. 1984 20 p
(Contract N00014-82-K-0814; Grant NSF MCS-81-06181)
(AD-A141782; AD-E750818; YALEU/DCS/RR-313) Avail: NTIS HC A02/MF A01 CSCL 12/1

Local Uniform Mesh Refinement (LUMR) is a powerful technique for solving hyperbolic partial differential equations. However, many problems contain regions where numerical dispersion is very large, such as step fronts. In these regions, mesh refinement is not very efficient. A better approach in these regions is to locally transform the coordinate system to move with the front. This document shows how to combine these two approaches in a way which maintains the advantages of LUMR and the effectiveness of moving grids. Experiments with 2-D scalar problems are presented. Author (GRA)

N84-29603# Oregon State Univ., Corvallis. Dept. of electrical and Computer Engineering.
NONLINEAR OBSERVABILITY AND MIXED-COORDINATE BEARING-ONLY SIGNAL PROCESSING
C. S. Hwang and R. R. Mohler 1984 28 p
(Contract N00014-81-K-0814)
(AD-A141824; OSU-ONR-TR-84-4) Avail: NTIS HC A03/MF A01 CSCL 12/1

A simple test to determine nonlinear system observability is presented here and applied to several examples. Most interesting is the bearing only tracking example which shows the need for relative maneuvers. A mixed coordinate system is compared favorably to the standard rectangular coordinates and the popular modified polar coordinates for accuracy with a continuous discrete truncated second order filter. Author (GRA)

N84-29604# Maryland Univ., College Park. Lab. for Numerical Analysis.
THE FACTORIZATION METHOD FOR TWO POINTS BOUNDARY VALUE PROBLEMS FOR ODE'S AND ITS RELATION TO THE FINITE DIFFERENCE METHOD Final Report
I. Babuska and V. Majer May 1984 25 p
(Contract N00014-77-C-0623; Grant NSF DMS-83-15316)
(AD-A141829; BN-1021) Avail: NTIS HC A02/MF A01 CSCL 12/1

The paper shows that the elimination method for solving the system of linear equation stemming from finite differences or finite elements is a special numerical method for solving certain initial value problems for an ordinary differential equation. Various conclusions are drawn from this observation. Author (GRA)

N84-29605# Naval Postgraduate School, Monterey, Calif.
ABSOLUTE BOUNDS ON THE MEAN AND STANDARD DEVIATION OF TRANSFORMED DATA FOR CONSTANT-DERIVATIVE TRANSFORMATIONS
N. C. Rowe Apr. 1984 47 p
(RR00001)
(AD-A141854; NPS52-84-006) Avail: NTIS HC A03/MF A01 CSCL 12/1

We investigate absolute bounds (or inequalities) on the mean and standard deviation of transformed data values, given only a few statistics on the original set of data values. Our work applies primarily to transformation functions whose derivatives are constant-sign for a positive range (e.g., logarithm, antilog, square root, and reciprocal). With such functions we can often get reasonably tight absolute bounds, so that distributional assumptions about the data needed for confidence intervals can be eliminated. We investigate a variety of methods of obtaining such bounds, first examining bounding curves which are straight lines, them those that are quadratic polynomials. While the problem of finding the best quadratic bound is an optimization problem with no closed-form solution, we display a variety of closed-form quadratic bounds which can come close to the optimal solution. We emphasize what can be done with prior knowledge of the mean and standard deviation of the untransformed data values, but do address some other statistics too. Author (GRA)

N84-29606# North Carolina Univ., Chapel Hill. Dept. of Statistics.
RANDOM FIELD SATISFYING A LINEAR PARTIAL DIFFERENTIAL EQUATION WITH RANDOM FORCING TERM
D. DeBrucq and C. Oliver 1984 26 p
(Contracts N00014-75-C-0491; N00014-81-K-0373)
(AD-A141886) Avail: NTIS HC A03/MF A01 CSCL 12/1

The authors first solve the equation $dX + aXdt = dN$, where dN represents a Poisson process, and then generalize to a Levy process. Finally, they solve a linear partial differential equation $DX = dL$ in strong distribution, meaning that the second member dL is a distribution process, generalization of Levy process on R. The results are then applied to wave propagation in underwater acoustics, and spatial correction is determined. Author (GRA)

N84-29607# Pittsburgh Univ., Pa. Inst. for Computational Mathematics and Applications.
ERROR ESTIMATIONS AND ADAPTIVE TECHNIQUES FOR NONLINEARIZED PARAMETRIZED EQUATIONS
W. C. Rheinboldt May 1984 37 p
(Contract N00014-80-C-0455; Grant NSF MCS-83-09926)
(AD-A142041; ICMA-84-72) Avail: NTIS HC A03/MF A01 CSCL 12/1

Many problems in science and engineering concern the

determination of steady-state equilibrium solutions of nonlinear equations. In general, for such problems, interest centers not so much on the computation of a few specific equilibria rather than on an assessment of the response of the system to the action of various external or internal influence quantities. In other words, we are interested in the effect of changes of the values of certain parameters upon the computed equilibria. Thus, other than in the typical linear case, for nonlinear problems we usually have to consider equations of the form which depend nonlinearly not only on the state variable z but also on a parameter vector lambda. Typically, z varies in some infinite-dimensional space Z while lambda belongs to a space lambda with some finite dimension m > or = z of (1.1) for a few a priori specified parameter vectors lambda. Instead, we have to look at the solutions of (1.1) as points (z, lambda) in the product X = Z x lambda of the state and and parameter space. Under fairly general conditions, the set of all solutions (z, lambda) of (1.1) in X forms a smooth surface - or more precisely an m-dimensional differentiable manifold - in that space. When (1.1) represents the equilibrium equation of a mechanical system, this manifold has been called the equilibrium surface of the system. GRA

N84-29608# Aerospace Corp., El Segundo, Calif. Engineering Group.
MULTI-SHAKER RANDOM MODE TESTING Final Report, Jan. - Jun. 1982
A. M. Kabe 30 Jan. 1984 38 p
(Contract F04701-83-C-0084)
(AD-A142094; TR-0084(4429-01)-1; SD-TR-84-11) Avail: NTIS HC A03/MF A01 CSCL 12/1

A mode survey test procedure that combines multi-shaker correlated broad-band random excitation of the test article with the mode isolation features of multiple shaker excitation. The procedure takes advantage of multiple shaker excitation to best isolate the target mode response from all other modes. Mode parameters are then established from direct observation of frequency response functions. The proposed test procedure derives from the recognition that response data of a structure, excited at multiple locations by proportional randomly varying forces, can be analyzed such that the results are equivalent to those obtained had the excitation been harmonic. The test procedure is described in detail and demonstrated by analytical simulation. Author (GRA)

N84-29609# Harry Diamond Labs., Adelphi, Md.
THEORETICAL METHODS IN THE CALCULATION OF THE BREMSSTRAHLUNG RECOIL FORCE IN A NONEQUILIBRIUM BEAM-PLASMA SYSTEM
H. E. Brandt May 1984 48 p
(DA Proj. 1L1-61101-A-91-A)
(AD-A142136; HDL-TR-2009) Avail: NTIS HC A03/MF A01 CSCL 12/1

The reduction of the lowest order nonlinear bremsstrahlung recoil force on the bare charge of an unperturbed relativistic test particle in a nonequilibrium beam-plasma system is derived from first principles. The purpose is to identify many of the important physical assumptions and mathematical techniques involved in Tsytovich's theory of nonlinear bremsstrahlung and radiative unstability. GRA

N84-29610# Spelman Coll., Atlanta, Ga.
NUMERICAL SOLUTIONS OF NON-UNIQUELY SOLVABLE INTEGRAL EQUATIONS USING FINITE RANK MODIFICATIONS Report, No. 4 (Final) 1 Jun. 1981 - 1 Mar. 1984
S. T. Bozeman 25 May 1984 7 p
(Grant DAAG29-81-G-0004; DA Proj. 1L1-61102-BH-57)
(AD-A142149; ARO-18208.2-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

The author's research has produced a new method for the approximation of eigenfunctions and generalized eigenfunctions of a type of integral operator by using finite range perturbations: Research continues on the development of a numerical procedure for solving Fredholm integral equations of the second kind that have no unique solution by employing the same type of finite rank modification. GRA

N84-29611# Nova Univ., Dania, Fla. Oceanographic Center.
ANALYSIS LINKING THE TENSOR STRUCTURE TO THE LEAST-SQUARES METHOD
G. Blaha Jan. 1984 107 p
(Contract F19628-82-K-0007)
(AD-A142159; AFGL-TR-84-0084; SR-3) Avail: NTIS HC A06/MF A01 CSCL 12/1

One of the main purposes of the geometrical approach to the least-squares adjustment as presented herein is to describe the adjustment theory in a simple and plausible way and, at the same time, to establish a niche for such an approach in a field that has been explored decades ago and then again in recent years. This development is based on differential geometry with tensor structure and notations. In expressing the desired tensor relations, it relies heavily on orthonormal space and surface vectors and on the extrinsic properties of surfaces linking the two kinds of vectors. In order to relate geometry to adjustments, the geometrical concepts are extended to an n-dimensional space and u-dimensional or r-dimensional surfaces, where n is the number of observations, u is the number of parameters in the parametric (or observation equation) method and r is the number of condition equations in the condition method, with n=u+r. Other methods are not treated here. GRA

N84-29612# Naval Postgraduate School, Monterey, Calif.
THE APPROXIMATE SOLUTION OF A SIMPLE CONSTRAINED SEARCH PATH MOVING TARGET PROBLEM USING MOVING HORIZON POLICIES
J. N. Eagle May 1984 23 p
(AD-A142164; NPS55-84-009) Avail: NTIS HC A02/MF A01 CSCL 12/1

A simple moving target problem is approximately solved for that search path minimizing the probability of non-detection subject to specified constraints on the search path. The solution procedure uses moving horizon policies. An almost asymptotically geometric structure is observed in the solution. Author (GRA)

N84-29613# Brown Univ., Providence, R. I. Center for Dynamical Systems.
ABELIAN INTEGRALS AND BIFURCATION THEORY
J. Carr (Heriot-Watt Univ.), S. N. Chow (Michigan State Univ.), and J. K. Hale Apr. 1984 47 p
(Contract DAAG29-83-K-0029; Grants AF-AFOSR-0198-81; NSF MCS-82-01768; NSF MCS-82-05355)
(AD-A142198; LCDS-84-7; AFOSR-84-0465TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Conditions are given for uniqueness of limit cycles for autonomous equations in the plane. The results are applicable to codimension two bifurcations near equilibrium points for vector fields. Author (GRA)

N84-29614# Columbia Univ., New York. Dept. of Applied Physics and Nuclear Engineering.
INVESTIGATION OF THREE DIMENSIONAL MESH GENERATION WITH PRECISE CONTROLS Interim Report, 1 May 1982 - 30 Sep. 1983
P. R. Eiseman and C. K. Chu Feb. 1984 9 p
(Grant AF-AFOSR-0176-82)
(AD-A142246; AFOSR-84-0462TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Under the first period of the grant support, mathematical developments were performed on algebraic, adaptive, surface, and orthogonal transformations. Algebraic transformations were extended by forming Boolen sums of multisurface transformations and, by appropriate compositions, lifting the results to curved 2-D surfaces. Orthogonal trajectories were a major part of the general development of orthogonal transformations under the grant support. Additional parts included field methods. This report summarizes progress made in these areas and lists publications resulting from the research. Author (GRA)

N84-29615# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
A GRAPH THEORETIC TECHNIQUE FOR THE GENERATION OF SYSTOLIC IMPLEMENTATIONS FOR SHIFT-INVARIANT FLOW GRAPHS
D. A. Schwartz and T. P. Barnwell, III 1984 5 p Presented at the Intern. Conf. on Acoustics, Speech and Signal Process
(Contract DAAG29-81-K-0024; AF Proj. 230-4)
(AD-A142251; AFOSR-84-0354TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper presents a general method for the transformation of algorithms described by shift-invariant fully-specified flow graphs into equivalent systolic realization. The method consists of a set of rules for the systematic manipulation of the flow graphs into systolic form utilizing a set of theorems from graph theory. It is shown that many of the previously published systolic algorithms and many new algorithms can be generated using this single procedure. Author (GRA)

N84-29616# Maryland Univ., College Park. Inst. for Physical Science and Technology.
AN ADAPTIVE METHOD OF LINES WITH ERROR CONTROL FOR PARABOLIC EQUATIONS OF THE REACTION-DIFFUSION TYPE Technical Note
I. Babuska and M. Bieterman Jun. 1984 70 p
(Contract N00014-77-C-0623)
(AD-A142253; BN-1023) Avail: NTIS HC A04/MF A01 CSCL 12/1

The main idea of the method of lines and its implementations is presented. Numerical results illustrating the approach are discussed. Author (GRA)

N84-29617# Massachusetts Inst. of Tech., Cambridge. Dept. of Mathematics.
[APPLICATION OF ASYMPTOTIC METHODS OF THEORETICAL COMPUTER SCIENCE AND COMBINATORICS TO PROBLEMS IN THE DESIGN OF VLSI CIRCUITS] Interim Scientific Progress Report, 1 Oct. 1982 - 30 Sep. 1983
D. J. Kleitman Feb. 1984 9 p
(Grant AF-AFOSR-0326-82)
(AD-A142262; AFOSR-84-0461TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

During this period the investigators produced 24 papers with 13 published and 11 submitted or in preparation. Titles include, "Wafer scale integration of systolic arrays,' "An approximation algorithm for Manhattan routing,' "Barel sets and circuit complexity,' "A complexity theoretical approach to randomness,' "Topological complete subgraphs of a random graph,' "Largest component in the k-cube,' "Sorting in clogn parallel steps,' and "Parallel computation using meshes of tress.' Author (GRA)

N84-29618*# Research Inst. of Colorado, Fort Collins.
CONDUCT OF THE INTERNATIONAL MULTIGRID CONFERENCE Final Report, 1 Jan. - 30 Sep. 1983
S. McCormick Feb. 1984 58 p Conf. held in Colorado, 5-8 Apr. 1983
(Contract NASw-3773; Grant AF-AFOSR-ISSA-83-00027)
(NASA-CR-173823; NAS 1.26:173823; AD-A142264; AFOSR-84-0450TR) Avail: NTIS HC A04/MF A01 CSCL 12A

The 1983 International Multigrid Conference was held at Colorado's Copper Mountain Ski Resort, April 5-8. It was organized jointly by the Institute for Computational Studies at Colorado State University, U.S.A., and the Gaseilschaft fur Mathematik und Datenverarbeitung Bonn, F.R. Germany, and was sponsored by the Air Force Office of Sponsored Research and National Aeronautics and Space Administration Headquarters. The conference was attended by 80 scientists, divided by institution almost equally into private industry, research laboratories, and academia. Fifteen attendees came from countries other than the U.S.A. In addition to the fruitful discussions, the most significant factor of the conference was of course the lectures. The lecturers include most of the leaders in the field of multigrid research. The program offered a nice integrated blend of theory, numerical studies, basic research, and applications. Some of the new areas of research that have surfaced since the Koln-Porz conference include: the algebraic multigrid approach; multigrid treatment of Euler equations for inviscid fluid flow problems; 3-D problems; and the application of MG methods on vector and parallel computers. GRA

N84-29619# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
A MAXIMUM-LIKELIHOOD APPROACH TO IMAGE SEGMENTATION BY TEXTURE
J. E. Bevington and R. M. Mersereau 1984 5 p
(Contract DAAG29-81-K-0024; AF Proj. 230-4)
(AD-A142323; AFOSR-84-0337TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper addresses the problem of segmenting an image by texture. Specifically, the investigators are concerned with estimating the trajectory of the boundary between the two regions characterized by different two-dimensional autocorrelation functions. An algorithm is developed which is an approximation to a maximum-likelihood estimator based on the assumption of Gaussian random fields with known mean and covariance. Preliminary experimental results are given. Author (GRA)

N84-29620# Cornell Univ., Ithaca, N.Y. Dept. of Computer Science.
TOPICS IN LARGE SPARSE NONLINEAR OPTIMIZATION Progress Report
T. F. Coleman Apr. 1984 3 p refs
(Contract DE-AC02-83ER-13069)
(DE84-008933; DOE/ER-13069/T1) Avail: NTIS HC A02/MF A01

Progress is reported in the development of practical and efficient algorithms and software for the solution of large sparse numerical optimization problems. Several of the originally proposed ideas will continue to be pursued. DOE

N84-29621# Sandia Labs., Albuquerque, N. Mex. Numerical Mathematics Div.
STABILITY OF EXPLICIT RUNGE-KUTTA METHODS
L. F. Shampine Mar. 1984 27 p refs
(Contract DE-AC04-76DP-00789)
(DE84-008902; SAND-84-0341) Avail: NTIS HC A03/MF A01

The classical theory of stability of explicit Runge-Kutta methods is concerned with Lipschitzian problems. It is not useful for stable problems with large Lipschitz constants. The classical theory of absolute stability considers some very special problems of this kind. The problems treated arise when a general problem is linearized. It is hoped that the behavior in the case of the special problem provide guidelines as to the behavior in the case of a general problem. A synthesis is proposed here which responds to this unsatisfactory state of affairs in the classical theory. DOE

N84-29622# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
INTERPOLATION OF WEIGHTED L SUB P AND SOBOLEV SPACES ON INTERVALS
Joergen Loefstroem 1984 12 p refs Submitted for publication
(CTH-Math-1984-04; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

Peetre's functional in the (weighted) L sub p-case is characterized in terms of a modulus of continuity. Author (ESA)

N84-29623# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
BOUNDARY PROBLEMS AND LARGE DEVIATION RESULTS FOR QUEUE LENGTH PROCESSES
Soeren Asmussen (Copenhagen University) and Hermann Thorisson 1984 15 p refs Submitted for publication
(CTH-Math-1984-05; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

Limit results for queue length process with finite time are derived. Equilibrium theory or steady process for GI/G/1 queue

length process models with traffic intensity less than one and with interarrival distribution non-lattice are studied. Ergodic properties of process describing excess over the boundary in reviewal theory is established. Author (ESA)

N84-29624# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
SOME RESULTS ON THE DIOPHANTINE EQUATION X-2+ D=Y-N
Leif Cardell 1984 14 p refs Submitted for publication
(CTH-Math-1984-06; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

The diophantine equation X squared plus D equal to Y to the nth power, where D is a positive square-free integer and D is congruent to 2 module 4 is studied. If D satisfies certain additional congruence and the equation has a solution, it is proved that N must divide the class-number of Q (root-D), where Q is a rational number. Author (ESA)

N84-29625# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
SOLUTION FORMULAS FOR THE DELTA DELTA BAR EQUATION AND WEIGHTED NEVANLINNA CLASSES IN THE POLYDISK
Mats Andersson 1984 43 p refs Submitted for publication
(CTH-Math-1984-07; ISSN-0347-2809) Avail: NTIS HC A03/MF A01

Explicit solutions for the differential operator delta delta bar equal to a differential form positive, closed of type (1,1)-current in the polydisk of n-dimensional complex space C which give minimal solutions in certain L sq spaces are shown. Formulas to find solutions in certain weighted Nevanlinna classes in the unit ball are used. Author (ESA)

N84-29626# Loughborough Univ. of Technology (England). Dept. of Mathematics.
ALGEBRAIC AND DYNAMIC CHARACTERIZATIONS OF POLES AND ZEROES AT INFINITY
A. C. Pugh and V. Krishnasloamy Feb. 1984 14 p refs
(MATHS-Res-175) Avail: NTIS HC A02/MF A01

The presence of infinite frequency poles and zeros in a rational transfer function matrix is considered and certain algebraic characterizations for their occurrence are given. One such characterization is shown to enable the transmission effects due to infinite poles and zeros to be ascertained in an extremely simple and direct way. Author (ESA)

N84-29627# Oxford Univ. (England). Dept. of Engineering Science.
REPRESENTATION OF UNCERTAINTY AND ROBUSTNESS TESTS FOR MULTIVARIABLE FEEDBACK SYSTEMS
Ian Postlethwaite and Yung Kuan Foo 1984 12 p refs Submitted for publication Sponsored by UK Science and Engineering Research Council
(OUEL-1517/84) Avail: NTIS HC A02/MF A01

Ways in which uncertainty can be represented in a control system are considered, and three kinds of robustness test are presented. The first is derived from Nyquist's stability criterion, and can be used if the plant and perturbed plant models have the same number of unstable poles. The second is derived from an inverse Nyquist stability criterion, and can be used if the plant and perturbed plant models have the same number of nonminimum phase zeros. The third is a combination of the other two tests, but does not require the plant and perturbed plant models to have either the same number of poles or the same number of zeros in the right-half complex plane. Author (ESA)

N84-29628# Oxford Univ. (England). Dept. of Engineering Science.
EXTENSIONS OF THE SMALL-MU TEST FOR ROBUST STABILITY
Yung Kuan Foo and Ian Postlethwaite Feb. 1984 27 p refs
(OUEL-1518/84) Avail: NTIS HC A03/MF A01

The notion of a topologically arcwise connected set is used to extend the small-mu test to accommodate unstable perturbations, and to provide a switching criterion between a Nyquist and an inverse Nyquist based test and between different nominal models. The extensions reduce conservatism and enable a more natural application of the small-mu test. Author (ESA)

N84-29629# Oxford Univ. (England). Dept. of Engineering Science.
AN H SUP INF MINIMAX APPROACH TO THE DESIGN OF ROBUST CONTROL SYSTEMS
Yung Kuan Foo and Ian Postlethwaite Mar. 1984 15 p refs Sponsored by UK Science and Engineering Research Council
(OUEL-1520/84) Avail: NTIS HC A02/MF A01

A feedback design problem, based on the minimization of a weighted combination of the sensitivity and complementary sensitivity matrices is posed. By including both functions it is possible to properly characterize robust stability, and to compromise in a simple way between the effect of a disturbance at the plant output and the effect of measurement noise. A solution to the problem is derived from the H sup inf approach. Author (ESA)

N84-29630# Oxford Univ. (England). Dept. of Engineering Science.
A ROBUSTNESS TEST FOR DISTRIBUTED FEEDBACK SYSTEMS
Ian Postlethwaite and Yung Kuan Foo Apr. 1984 10 p refs Presented at 4th IMA Intern. Conf. on Control Theory, 11-13 Sep. 1984 Sponsored by UK Science and Engineering Research Council
(OUEL-1522/84) Avail: NTIS HC A02/MF A01

A robustness test for a class of distributed feedback systems, which involves a switching criterion to prevent the characteristic gain loci (or equivalently the inverse characteristic gain loci) from passing through -1 as the plant is perturbed continuously throughout a set of possible plant models is presented. The test is an exact generalization of one for finite dimensional systems. The test does not require the plant and perturbed plant models to have the same number of unstable poles. Author (ESA)

N84-29631# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Applied Mathematics.
HOPF BIFURCATION AND SYMMETRY: TRAVELING AND STANDING WAVES ON THE CIRCLE
S. A. VanGils Dec. 1983 45 p refs Submitted for publication
(MC-TW-249/83; B8467329) Avail: NTIS HC A03/MF A01

Hopf bifurcation in the presence of O(2) symmetry was considered. The reaction diffusion equation u sub t = Du sub xx + f(mu, u) provided with periodic boundary conditions served as a model problem. The bifurcation of a torus of standing waves and two circles of travelling waves was proved and the stability (with asymptotic phase) of these periodic solutions was computed, giving explicit formulas. It was demonstrated how a small perturbation which breaks part of the symmetry leads to secondary bifurcation. Author (ESA)

N84-29632# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
ON ESTIMATING A PARAMETER AND ITS SCORE FUNCTION
C. A. J. Klaassen and W. R. vanZwet Jan. 1984 16 p refs Presented at Neyman-Kiefer Conf., Berkeley, Calif., 1983
(Contract NO0014-80-C-0163)
(CWI-MS-R8402; B8467335) Avail: NTIS HC A02/MF A01

Estimating a real-valued parameter p in the presence of an abstract nuisance parameter n, such as an unknown distribution shape, was considered. The score functions for p and n are orthogonal, so that fully asymptotically efficient estimation is not a priori impossible. For fixed sample size, a bound of Cramer-Rao type was provided. The bound differs from the classical one for known n by a term involving the integrated mean square error of an estimator of a multiple of the score function for p for the case where p is known. This implies that an estimator of p can only

perform well over a class of shapes n if it is possible to estimate the score function for p accurately over this class. Author (ESA)

N84-29633# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
ON THE STABLE SIZE DISTRIBUTION OF POPULATIONS REPRODUCING BY FISSION INTO TWO UNEQUAL PARTS
H. J. A. M. Heijmans Jan. 1984 31 p refs Submitted for publication
(CWI-AM-R8401; B8467330) Avail: NTIS HC A02/MF A01

A nonlinear model describing the dynamics of a continuous culture of cells characterized by their size only, and reproducing by fission into unequal parts, was formulated. It was assumed that cells grow proportionally to their size. Using techniques from dynamical systems theory, results concerning the existence of a globally stable equilibrium were established. Author (ESA)

N84-29634# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
GLOBAL BIFURCATION OF A LOGISTIC DELAY MAP
H. A. Lauwerier Jan. 1984 23 p refs
(CWI-AM-R8402; B8467331) Avail: NTIS HC A02/MF A01

The planar map x' = y, y' = phi (x,y) connected to the difference x sub n+1 = ax sub n (1-(1-b) x sub n -bx sub n-1) with $a > 1$, $0 < b < 1$ was considered. The unstable manifold of the fixed point (0,0) was determined explicitly as an analytic curve. The stable manifold consists of an infinity of algebraic curves and forms the boundary of the escape region, the set of starting-points of orbits going to infinity. The case $b = 1/2$ was studied. For $a > 3$ there always exists an unstable 4-cycle. For this cycle the secondary unstable manifolds were also determined explicitly. For the case $b = 1/2$ a Feigenbaum scenario of repeated period-doubling is observed. However, the convergence to Feigenbaum's universal constant is rather slow. Author (ESA)

N84-29635# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
THE EXIT PROBLEM FOR A STOCHASTIC DYNAMICAL SYSTEM IN A DOMAIN WITH ALMOST EVERYWHERE CHARACTERISTIC BOUNDARIES
J. Grasman and J. V. Lankelma Jan. 1984 17 p refs Submitted for publication
(CWI-AM-R8403; B8467332) Avail: NTIS HC A02/MF A01

The influence of small random perturbations was analyzed for a dynamical system with a stable equilibrium point using singular perturbation techniques. The WKB approximation to the asymptotic solution of the exit problem for domains with characteristic boundaries and containing a critical point is not valid because of the turning-point behavior of the Fokker-Planck equation near such a point. This difficulty was resolved by changing the domain for the characteristic exit problem. Explicit computations were carried out for a problem originating from theoretical population biology, namely the three-dimensional hypercycle. Author (ESA)

N84-29636# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
ENTIRE FUNCTIONS FOR THE LOGISTIC MAP 2
H. A. Lauwerier Jan. 1984 38 p refs Submitted for publication
(CWI-AM-R8404; B8467333) Avail: NTIS HC A03/MF A01

The asymptotic behavior of the entire functions F satisfying the functional equation F (az) = aF (z) (1-F(z)), $1 < a <$ or = 4, with F (0) = 0, F' (0) = 1, was studied on rays in the complex plane. The Julia set of the logistic map was brought into relation with the zeros of F(z). Author (ESA)

N84-29637# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Operations Research and System Theory.
ASYMPTOTIC ANALYSIS OF A QUEUEING SYSTEM WITH A TWO-DIMENSIONAL STATE SPACE
J. P. C. Blanc Jan. 1984 26 p refs Submitted for publication
(CWI-OS-R8402; B8467336) Avail: NTIS HC A03/MF A01

A technique for the analysis of the asymptotic behavior in the long run of queueing systems with two waiting lines is developed. The generating function of the time-dependent joint queue length distribution is obtained via the theory of boundary value problems of the Riemann-Hilbert type and by introducing a conformal mapping of the unit disk onto a given domain. In the asymptotic analysis, theorems on the boundary behavior of such conformal mappings are used. Author (ESA)

N84-29638# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Operations Research and System Theory.
BOUNDED TILING, AN ALTERNATIVE TO SATISFIABILITY
M. W. P. Savelsbergh and P. vanEmdeBoas Mar. 1984 14 p refs Submitted for publication
(CWI-OS-R8405; B8467338) Avail: NTIS HC A02/MF A01

Bounded tiling as an alternative master problem for the theory of NP-completeness is proposed. The reduction to clique is essentially the same as the reduction from satisfiability. For exact cover the reduction is much easier than the traditional road along 3DM. The reduction to satisfiability is rather simple, writing down the necessary and sufficient conditions for the existence of a tiling of the plane immediately gives the desired disjunctive normal form. Reduction to directed Hamiltonian cycle requires an instance of component design. The main advantage of the bounded tiling problem over satisfiability lies in the conceptual simplicity of the problem and the proof of its NP-completeness. Combined with the flexibility which makes the problem useful at various levels of undecidability or intractability, this simplicity makes it a valuable tool for the purpose of introducing the theory of NP-completeness to non-mathematicians. Author (ESA)

N84-29639# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
UNIQUENESS OF WHITTAKER MODELS FOR IRREDUCIBLE OBJECTS IN Alg(Mp(k))
G. F. Helminck Dec. 1983 9 p refs
(MC-ZW-203/83; B8467328) Avail: NTIS HC A02/MF A01

Methods to prove the uniqueness of Whittaker-models for irreducible algebraic representations of the metaplectic group Mp(k) are described. It is shown that this uniqueness implies that of the models used for automorphic L-functions of half-integral weight. Author (ESA)

N84-29843# Joint Publications Research Service, Arlington, Va.
NUMERIC EXTENSION OF PERIODIC SOLUTIONS TO LAGRANGIAN SYSTEM WITH TWO DEGREES OF FREEDOM Abstract Only
A. G. Sokolskiy and S. A. Khovanskiy *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 66 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 851-860 (For primary document see N84-29823 19-12)
Avail: NTIS HC A07

N84-29286# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
RELATIONSHIPS BETWEEN ELLIPSOID PARAMETERS [BEZIEHUNGEN ZWISCHEN DEN ELLIPSOIDPARAMETERN]
Dieter Ehlert *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 9 1983 p 11-23 refs In GERMAN; ENGLISH and FRENCH summary (For primary document see N84-29286 19-43)
Avail: NTIS HC A05/MF A01

N84-29809# Universidade Estadual de Paulista, Guaratingueta (Brazil). Dept. de Matematica.
STABILITY OF EQUILIBRIUM IN PROBLEMS WITH DOUBLE RESONANCE
Maria Helena Carrijo de Faria Lacaz *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 19-25 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29812# National Observatory, Rio de Janeiro (Brazil).
LAGRANGIAN SINGULARITIES: APPLICATIONS

Roberto Vieira Martins *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 47-54 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29813# Sao Paulo Univ. (Brazil). Dept. de Astronomia.
FORMAL SOLUTIONS IN A DOUBLE RESONANT PROBLEM
T. Yokoyama *In its* The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 55-61 refs Sponsored in part by National Council of Research of Brazil and the Research Foundation of Sao Paulo (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29814# Graz Univ. (Austria). Inst. fuer Astronomie.
NUMERICAL INTEGRATION WITH LIE-SERIES
R. Dvorak and A. Hanslmeier *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 65-72 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29815# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A STOCHASTIC APPROACH TO GLOBAL ERROR ESTIMATION IN THE NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS
A. Rios Neto and N. C. Cardenuto *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 73-81 refs Previously announced as N82-18944 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29816# Sao Paulo Univ. (Brazil). Dept. de Astronomia.
A NUMERICAL AVERAGING PROCEDURE FOR THE GALILEAN SATELLITES SYSTEM
M. Sato, S. Farraz-Mello, and P. E. Nacozy (Texas Univ., Austin) *In its* The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 83-89 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29836# Sao Paulo Univ. (Brazil). Escola Politenica.
A NOTE ABOUT LIE SERIES AND SOME APPLICATIONS Abstract Only
G. E. O. Giacaglia *In its* The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 298 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N84-29640*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE SEMI-MARKOV UNRELIABILITY RANGE EVALUATOR PROGRAM
Ricky W. Butler Jun. 1984 33 p refs
(NASA-TM-86261; NAS 1.15:86261) Avail: NTIS HC A03/MF A01 CSCL 12A

The SURE program is a design/validation tool for ultrareliable computer system architectures. The system uses simple algebraic formulas to compute accurate upper and lower bounds for the death state probabilities of a large class of semi-Markov models. The mathematical formulas used in the program were derived from a mathematical theorem proven by Allan White under contract to NASA Langley Research Center. This mathematical theorem is discussed along with the user interface to the SURE program.
Author

N84-29641# Wisconsin Univ., Madison. Mathematics Research Center.
JACKKNIFE AND BOOTSTRAP INFERENCE IN REGRESSION AND A CLASS OF REPRESENTATIONS FOR THE LSE Technical Summary Report
C. F. J. Wu Apr. 1984 56 p
(Contract DAAG29-80-C-0041)
(AD-A141505; MSR-TSR-2675) Avail: NTIS HC A04/MF A01 CSCL 12/1

A class of representations for the least squares estimator is presented and their applications sketched. Partly motivated by one such representation, the author proposes a class of weighted jackknife estimators of variance of the least squares estimator by deleting any fixed number of observations at a time. These estimators are unbiased for homoscedastic errors and a special case, the delete-one jackknife variance estimator, is almost unbiased for heteroscedastic errors. The method is extended in various ways, including the use of the the jackknife histogram, for variance and interval estimation with nonlinear parameters. Three bootstrap methods are considered. It is shown that none of them has the robustness property enjoyed by the (weighted) delete-on jackknife. Subset sampling with variable subset size is also considered. Several bias-reducing estimators are proposed. They are motivated by the observation that bias-reduction is mathematically equivalent to unbiased estimation of variance. Some simulation results on estimating the ratio of two normal parameters are reported.
Author (GRA)

N84-29642# Wisconsin Univ., Madison. Center for Mathematics Research.
ESTIMATION OF THE GENERALIZED EXTREME-VALUE DISTRIBUTION BY THE METHOD OF PROBABILITY WEIGHTED MOMENTS
J. R. M. Hosking, J. R. Wallis, and E. F. Wood Apr. 1984 28 p
(Contract DAAG29-80-C-0041)
(AD-A141696; MRC-TSR-2674) Avail: NTIS HC A03/MF A01 CSCL 12/1

The authors use the method of probability weighted moments to derive estimators of the parameters and quantiles of the generalized extreme-value distribution. They investigate the properties of these estimators in large samples, via asymptotic theory, and in small and moderate samples, via computer simulation. Probability weighted moment estimators have low variance and no severe bias, and compare favorably with estimators obtained by the methods of maximum likelihood or sextiles. The method of probability weighted moments also yields a convenient and powerful test of whether an extreme-value distribution is of Fisher-Tippett type I, II, or III.
Author (GRA)

N84-29643# Stanford Univ., Calif. Dept. of Statistics.
A UNIFORM BOUND FOR THE TAIL PROBABILITY OF KOLMOGOROV-SMIRNOV STATISTICS
I. Hu May 1984 9 p
(Contract N00014-77-C-0306)
(AD-A141761; SU-TR-28) Avail: NTIS HC A02/MF A01 CSCL 12/1

Let X sub 1, X sub 2,... be independent, identically distributed random variables with a continuous but unknown distribution function F. In testing goodness of fit, that is, we want to test F = F sub o for some specific choice of F sub 0, the commonly used test statistics are shown. The purpose of this paper is to give a bound for the tail probability of D sub n(-) in the following form.
GRA

N84-29644# Texas A&M Univ., College Station.
MULTIPLE TIME SERIES MODELING AND TIME SERIES THEORETIC STATISTICAL METHODS Final Technical Report
E. Parzen May 1983 8 p
(Contracts N00014-82-MP-20001; N00014-81-MP-10001)
(AD-A141891) Avail: NTIS HC A02/MF A01 CSCL 12/1

This is a final report on the research project entitled Multiple Time Series Modeling and Time Series Theoretic Statistical Methods for the period 1 April 1981 - 31 March 1983.
Author (GRA)

N84-29645# Massachusetts Inst. of Tech., Cambridge.
[LINEAR AND NONLINEAR FILTERING AND STOCHASTIC CONTROL] Interim Technical Report, 15 Mar. 1983 - 14 Mar. 1984
S. K. Mitter and B. Levy May 1984 20 p
(Grant AF-AFOSR-0135-82)
(AD-A142229; LIDS-IR-1374; AFOSR-84-0473TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Research was carried out on the following main topics: (1) Linear and Nonlinear Filtering and related Scattering and Inverse Scattering Problems; and (2) Stochastic Control with Partial Observations. Technical details of the research may be found in the reports, theses, and papers cited in the references. A list of publications supported wholly or partially by this grant is included at the end of this report. GRA

N84-29646# Educational Testing Service, Princeton, N. J.
NEW APPROACHES TO ROBUST CONFIDENCE INTERVALS FOR LOCATION: A SIMULATION STUDY Final Report, 21 Sep. 1981 - 30 Sep. 1983
H. I. Braun and D. Pregibon (AT & T Bell Labs.) Jun. 1984 39 p Prepared in cooperation with AT & T Bell Labs., Murray Hill, N.J.
(Contract DAAG29-81-K-0178)
(AD-A142248; ARO-18484.1-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

The robustness of validity of four methods for setting confidence intervals for a location parameter when the scale is unknown are investigated. Three methods involve estimating the variance of an M- estimate of location while the fourth is a procedure suggested by Maritz, based on a permutation argument. The first three methods use either a finite sample approximation to the asymptotic variance (a well-known standard) or make inferences on the basis of the shape of the putative likelihood function. The latter approach is related to the work of Sprott, as well as that of Efron and Hinkley on conditional inference. Overall, the Maritz procedure performs best though the standard does surprisingly well. Author (GRA)

N84-29647# Spectral Sciences, Inc., Burlington, Mass.
APPLICATION OF THE DIRECT SIMULATION MONTE CARLO METHOD TO MASS SPECTROMETER FLOW Technical Report, 26 Jan. 1983 - 26 Jan. 1984
J. B. Elgin Feb. 1984 53 p
(Contract F19628-82-C-0048)
(AD-A142326; SSI-TR-45; AFGL-TR-84-0077; SR-2) Avail: NTIS HC A04/MF A01 CSCL 12/1

Technical progress is described in the development of a Monte Carlo code to simulate the flow within a mass spectrometer used to sample stratospheric ion clusters. A procedure is presented for spatially segmenting the solution region and a new formulation of the molecular internal energy model is described in terms of a Chi-Square distribution function. The modeling of accelerations due to electric fields is discussed and a comparison with published data for diffusive species separation is made. Author (GRA)

N84-29648# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
ON REGENERATIVE AND ERGODIC PROPERTIES OF THE k-SERVER QUEUE WITH NONSTATIONARY POISSON ARRIVALS
Hermann Thorisson 1984 15 p refs Submitted for publication
(CTH-Math-1984-2; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

A k-server queue with nonstationary Poisson arrivals is considered. Regeneratives and ergodic properties are given. Regenerative properties depend on stochastic process regeneratives in the traditional sense and the intensity of the arrival process. Ergodic properties depend on restrictions of the intensity of the arrival process and the service intensity. Ergodicity is characterized by the approximation of the transition probabilities of non-time-homogeneous Markov process to a probability measure for each real number. Author (ESA)

N84-29649# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
RANDOM CAPACITIES AND THEIR DISTRIBUTIONS
Tommy Norberg 1984 54 p refs Submitted for publication Sponsored by Swedish Natural Science Research Council
(CTH-Math-1984-03; ISSN-0347-2809) Avail: NTIS HC A04/MF A01

Random processes on the compact sets in a topological space which maps the empty set on zero and is increasing and outercontinuous (random capacity) are constructed. General theory for probability measures on random capacities (U) is developed and the results for locally finite Borel measures (M), closed sets (F) and non-negative upper semicontinuous (USC) functions are unified. The topology on U is considered and relative topology on M, on F and on USC respectively coincide with vague topology, Fell topology and hypotopology respectively. Existence and convergence theorems for distribution on U are proved. Results of special cases of random measures, random semicontinuous functions and random sets are restated and are generalized. Infinitely divisible distributions of random semicontinuous functions are studied and Matheron's and Balkema-Resnick's methods are characterized and are generalized. Author (ESA)

N84-29650# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
INTERVAL ESTIMATES FOR POSTERIOR PROBABILITIES IN A MULTIVARIATE NORMAL CLASSIFICATION MODEL
A. W. Ambergen and W. Schaafsma (Groningen Rijksuniv.) Aug. 1983 13 p refs
(MC-SW-96/83; B8467322) Avail: NTIS HC A02/MF A01

The asymptotic distribution of estimators for the posterior probability that a p dimensional observation vector originates from one of k normal distributions with identical covariance matrices is studied. The estimators are based on training samples from the k distributions involved. Observation vector and prior probabilities are regarded as given constants. The validity of various estimators and approximate confidence intervals is investigated by simulation experiments. Author (ESA)

N84-29651# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
PERIODICITY AND ABSOLUTE REGULARITY
H. Berbee Dec. 1983 23 p refs
(MC-SW-97/83; B8467323) Avail: NTIS HC A02/MF A01

For a stationary ergodic process, it was proved that the dependence coefficient associated with absolute regularity has a limit connected with a periodicity concept. Similar results are then obtainable for stronger dependence coefficients. The periodicity concept was studied separately, and it was seen that the double tail sigma-field can be trivial while the period is two. The total variation metric was used. Author (ESA)

N84-29652# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
ON THE EDGEWORTH EXPANSION FOR THE LOGARITHM OF THE LIKELIHOOD RATIO, PART 2
D. M. Chibisov (Steklow Mathematical Institute, Moscow) and W. R. vanZwet (Leiden University, The Netherlands) Jan. 1984 15 p refs Presented at 3rd Prague Symp. on Asymptotic Statistics, Prague Sponsored by Netherlands Organization for the Advancement of Pure Research (ZWO)
(CWI-MS-R8401-Pt-2; B8467334) Avail: NTIS HC A02/MF A01

Conditions under which the distribution function of the logarithm of the likelihood ratio possesses an Edgeworth expansion were discussed. The underlying model is that of independent but not necessarily identically distributed random variables, and the two sequences of product distributions are assumed to be continuous. Analysis of the problem in full generality gives a result similar to one which characterized contiguity and asymptotic normality of the logarithm of the likelihood ratio. It was shown how this result may be simplified for differentiable likelihoods. Author (ESA)

N84-29653# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
ASYMPTOTIC LAWS OF THE TESTS AND RUPTURE ESTIMATORS IN A CLASSICAL STATISTICAL MODEL [LOIS ASYMPTOTIQUES DES TESTS ET ESTIMATEURS DE RUPTURE DANS UN MODELE STATISTIQUE CLASSIQUE]
Jean Deshayes and Dominique Picard (Paris-Sud University, Orsay, France) Mar. 1984 23 p refs Presented at Rencontres Franco-Danoises de Statistique, Luminy, France, Jan. 1984
(ENST-84C001; ISSN-0751-1337) Avail: NTIS HC A02/MF A01

The asymptotic behavior of likelihood methods for regular statistical models with change-point are investigated. The use of invariance theorems for the likelihood process is used to solve many problems including behavior near the edges, renormalization of the test statistics and linking of the time parameter and the statistical parameters of a change. Author (ESA)

N84-29654# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
BACKWARD LIMITS OF NON-TIME-HOMOGENEOUS REGENERATIVE PROCESSES
Hermann Thorisson 1984 13 p refs Submitted for publication
(CTH-Math-1984-09; ISSN-0347-2809) Avail: NTIS HC A02/MF A01

A non-time-homogeneous regenerative process starting from regeneration at time s is considered. It is proved, under mild regularity conditions on the regeneration times, that the distribution of the process in the time-interval (t, infinity) stabilizes as s tends backward to negative infinity. The proof is based on coupling and the completeness of probability measures with respect to total variation. As a byproduct, the existence of a non-time-homogeneous process starting from regeneration at negative infinity is obtained. Results on rates of convergence are also obtained, the analog of the renewal measure is considered and a non-time-homogeneous key renewal theorem is presented. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N84-29655*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A NUMERICAL SCHEME FOR THE IDENTIFICATION OF HYBRID SYSTEMS DESCRIBING THE VIBRATION OF FLEXIBLE BEAMS WITH TIP BODIES Final Report
I. Gary Rosen (Draper (Charles Stark) Labs., Inc., Cambridge, Mass.) Jun. 1984 38 p refs
(Contracts NAS1-17070; F30602-81-C-0180)
(NASA-CR-172388; ICASE-84-23; NAS 1.26:172388) Avail: NTIS HC A03/MF A01 CSCL 12B

A cubic spline based Galerkin-like method is developed for the identification of a class of hybrid systems which describe the transverse vibration to flexible beams with attached tip bodies. The identification problem is formulated as a least squares fit to data subject to the system dynamics given by a coupled system of ordnary and partial differential equations recast as an abstract evolution equation (AEE) in an appropriate infinite dimensional Hilbert space. Projecting the AEE into spline-based subspaces leads naturally to a sequence of approximating finite dimensional identification problems. The solutions to these problems are shown to exist, are relatively easily computed, and are shown to, in some sense, converge to solutions to the original identification problem. Numerical results for a variety of examples are discussed. M.G.

N84-29656# SRI International Corp., Menlo Park, Calif.
ADAPTIVE MODELING AND REAL-TIME SIMULATION Final Technical Report, Jun. 1981 - Jun. 1983
W. M. Tyson Griffiss AFB, N.Y. RADC Jan. 1984 84 p
(Contract F30602-81-C-0218; AF Proj. LDFP)
(AD-A141648; RADC-TR-83-308) Avail: NTIS HC A05/MF A01 CSCL 12/2

This is the final report covering progress on a two year research effort towards the development of basic technology for adaptive modeling and real-time computer simulation to support decision-making in a number of critical planning situations that arise during the execution of tactical air missions. Both tactical and defensive planning must be done quickly - the side that is faster and better prepared will have the advantage. Still, plans must be accurate. Planning too quickly may cause important information to be overlooked - information that may affect whether the plan will achieve its goal. Computers should be able to support decision-making and planning, but currently, for a number of reasons, these do not approach their potential use in this field. One major reason is that understanding of planning and modeling of real world situations are inadequate. These adequacies involve: World models; A model of time; Understanding of inaccurate information; Propagating the effects of information and retracing (backtracking) that propagation if necessary; and Processing speed, especially as regards deduction and simulation. This report reviews these difficulties and developed approaches to solving these. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N84-29657# Michigan Univ., Ann Arbor. Dept. of Electrical and Computer Engineering.
VECTORIZED SPARSE ELIMINATION Final Report, 1 May 1980 - 30 Apr. 1984
D. A. Calahan 1 Mar. 1984 13 p
(Grant AF-AFOSR-0158-80; AF Proj. 2304)
(AD-A141131; AFOSR-84-0367TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This grant concerned the case of vector processors such as the CRAY-1 in the solution of sparse systems of equations. The study produced three major classifications of results: (1) Algorithms and related mathematical software for sparse solution on single processors (uniprocessors); (2) Preliminary projection of vector multiprocessor performance on linear algebra codes; and (3) Cooperative work on vector sparse matrix algorithms with AFFDL for CFD and structures codes, and with UC/Berkeley for circuit simulation. GRA

N84-29658# Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Pure Mathematics.
G-SPACES: COMPACTIFICATIONS AND PSEUDOCOMPACTNESS
J. deVries Sep. 1983 15 p refs Submitted for publication
(MC-ZW-200/83; B8467325) Avail: NTIS HC A02/MF A01

The theory on equivariant topology was reviewed and various results were proved. If G is a locally compact topological group, then the concept of G-pseudocompactness for Tychonov G-spaces was shown to coincide with ordinary pseudocompactness. The equality of the maximal G-compactification and the Stone-Cech compactification was investigated. Author (ESA)

N84-29659# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Pure Mathematics.
LOCALLY 4-BY-4 GRID GRAPHS
A. Blokhuis and A. E. Brouwer Jan. 1984 23 p refs Submitted for publication
(CWI-PM-R8401; B8467339) Avail: NTIS HC A02/MF A01

A characterization of the Johnson graphs (and certain quotients of these) as locally grid graphs was obtained such that two points at distance two have precisely four common neighbors. A complete determination of all graphs that are locally a 4x4 grid was achieved. There are 4 such graphs, with 35, 40, 40 and 70 vertices. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N84-29660# Hunter Coll., New York. Dept. of Physics and Astronomy.
ION CONDUCTION POLY(VINYL ACETATE) Interim Technical Report, No. 1
M. C. Wintersgill, J. J. Fontanella, J. P. Calame, S. G. Greenbaum, and C. G. Andeen Jun. 1984 14 p
(Contract N00014-84-K-0010)
(AD-A142249; ITR-1) Avail: NTIS HC A02/MF A01 CSCL 20/3

AC conductivity and Li7 NMR measurements of poly(vinyl acetate) complex with LiClO4 are reported. The observations of temperature-activated conductivity, and Li7 motional narrowing and rapid spin-lattice relaxation rates are consistent with fast ion transport in the complex. In addition, a lithium cell utilizing the complex as the electrolyte exhibited an open circuit voltage of approx. 3V while no voltage was detected for an identical cell with a pure poly (vinyl acetate) electrolyte. Author (GRA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution*.

N84-29661*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
FREE JET FEASIBILITY STUDY OF A THERMAL ACOUSTIC SHIELD CONCEPT FOR AST/VCE APPLICATION: SINGLE STREAM NOZZLES Final Report
R. K. Majjigi, J. F. Brausch, B. A. Janardan, T. F. Balsa, P. R. Knott, and N. Pickup Washington NASA Jul. 1984 354 p refs
(Contract NAS3-22137)
(NASA-CR-3758; E-2132; NAS 1.26:3758; R82AEB494) Avail: NTIS HC A16/MF A01 CSCL 20A

A technology base for the thermal acoustic shield concept as a noise suppression device for single stream exhaust nozzles was developed. Acoustic data for 314 test points for 9 scale model nozzle configurations were obtained. Five of these configurations employed an unsuppressed annular plug core jet and the remaining four nozzles employed a 32 chute suppressor core nozzle. Influence of simulated flight and selected geometric and aerodynamic flow variables on the acoustic behavior of the thermal acoustic shield was determined. Laser velocimeter and aerodynamic measurements were employed to yield valuable diagnostic information regarding the flow field characteristics of these nozzles. An existing theoretical aeroacoustic prediction method was modified to predict the acoustic characteristics of partial thermal acoustic shields. B.G.

N84-29662*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ROTORCRAFT NOISE
Robert J. Huston, comp. Washington Jul. 1982 424 p refs Proc. of the NASA/US Helicopter Ind. Workshop on Aerodyn. Noise Prediction/Noise Reduction, Hampton, Va., 29-31 Mar. 1982
(NASA-CP-2234; L-15408; NAS 1.55:2234) Avail: NTIS HC A18/MF A01 CSCL 20A

The establishment of a realistic plan for NASA and the U.S. helicopter industry to develop a design-for-noise methodology, including plans for the identification and development of promising noise reduction technology was discussed. Topics included: noise reduction techniques, scaling laws, empirical noise prediction, psychoacoustics, and methods of developing and validing noise prediction methods. For individual titles, see N84-29663 through N84-29684.

N84-29663*# Sikorsky Aircraft, Stratford, Conn. Aeromechanics Branch.
ACOUSTIC DESIGN CRITERIA AND VALIDATION
Peter Arcidiacono *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 5-32 (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

The tools currently available for acoustic design risk reduction and problem solving are limited in accuracy and do not encompass all design parameters. Assuming available technology, designing helicopters to confidently meet noise limits as were proposed by the FAA and were now adopted by ICAO will result in significant design compromises. Author

N84-29664*# Bell Helicopter Co., Fort Worth, Tex. Acoustics Dept.
NOISE REDUCTION TECHNIQUES: CRITERIA AND VALIDATION
Jan M. Drees *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 33-43 (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

Modification of proposed rules and regulations to provide operational flexibility and address derivations were investigated. Prediction capabilities to meet the roles need to be improved. A historical overview of current problems was reviewed in the light of past history. B.G.

N84-29665*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A COMPARISON OF WIND TUNNELS SUITABLE FOR ROTORCRAFT NOISE STUDIES **c09**
Paul T. Soderman *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 45-62 (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 14B

Many good small scale facilities are available for rotorcraft noise research. Ames 40 x 80/80 x 120 probably is a good large scale facility for acoustic research of large or small rotorcraft, but the acoustic quality of the modified facility was not yet measured. DNW is probably the best aeroacoustic facility, but may be expensive. Other parameters to consider besides background noise are turbulent level and scale, restructed measurement field, local reflections, and speed range. Advanced measurement techniques improve data quality from any facility. B.G.

N84-29666*# Hughes Helicopters, Culver City, Calif.
NOISE REDUCTION EXPERIENCE AT HUGHES HELICOPTER, INC.
Damaraju S. Janakiram *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 63-84 refs (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

Noise reduction is mostly limited to light helicopters whose noise signature is dominated by their tail rotors. It is primarily hardware oriented. Well known noise reduction techniques such as reduction of rotor speeds with an accompanying increase in solidity to maintain performance, engine noise reduction with the use of exhaust mufflers, and acoustic blanketing of transmission and engine compartment are used. The concept of blade phasing as a means of reducing tail rotor noise is also used. Engine noise (exhaust noise), power train noise and airframe noise becomes important at low rotor tip speeds and means must be found to reduce these noise sources if further noise reductions are desired. The use of a special test rig aids in isolating the various noise sources and arriving at the penalties (performance or payload) involved in quieting them. Significant noise reduction are achieved for the light helicopter with minimum performance or weight penalties because of the dominance of a single noise source (the tail rotor). M.A.C.

N84-29667*# Boeing Vertol Co., Philadelphia, Pa.
BOEING VERTOL NOISE REDUCTION EXPERIENCE
William W. Walls *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 85-96 (For primary document see N84-29662 19-71)

Avail: NTIS HC A18/MF A01 CSCL 20A

Boeing Vertol Model 234, CH-47D and 347 tandem rotor helicopters demonstrate noise levels that comply with the overall noise standard requirements. The helicopters achieve these noise levels because they are, by design, free of impulsive noise in level flight and climb. Avoiding an impulsive noise signature is achieved by developing and applying configuration design criteria that eliminate blade vortex intersections and recognize advancing blade tip noise limitations in high speed forward flight. Airfoil design, rotor separation and rotor tipspeed selection all contribute to the noise control. Compliance with the approach element of the standards is marginal at best. The approach problem is not appreciably alleviated by reduced tipspeed and airfoil design. Since it is a single rotor phenomenon, it is not alleviated by rotor separation in the tandem configuration. Tip shapes may provide the answer, but to date this approach has not led to a satisfactory solution. M.A.C.

N84-29668*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

ROTARY WING AERODYNAMICALLY GENERATED NOISE

F. J. Schmitz and H. Andrew Morse *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 97-106 ref Prepared in cooperation with the Army Aeromechanics Lab., Moffett Field, Calif. (For primary document see N84-29662 19-71)

Avail: NTIS HC A18/MF A01 CSCL 20A

The history and methodology of aerodynamic noise reduction in rotary wing aircraft are presented. Thickness noise during hover tests and blade vortex interaction noise are determined and predicted through the use of a variety of computer codes. The use of test facilities and scale models for data acquisition are discussed. M.A.C.

N84-29669*# Army Structures Lab., Hampton, Va.

NASA/ARMY SUPPORTED NOISE SOURCE/NOISE REDUCTION PROGRAMS AT LANGLEY

Danny R. Hoad *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 107-122 refs (For primary document see N84-29662 19-71)

Avail: NTIS HC A18/MF A01 CSCL 20A

The helicopter noise research related to noise source mechanism identification and reduction includes many of the critical noise problems experienced by the helicopter. These include blade vortex interaction (BVI) noise, broadband turbulence ingestion noise, rotor blade self noise including trailing edge effects, model scale effects evaluations, and to some degree main rotor/tail rotor interaction noise. Issues that arise from this evaluation are; (1) Broadband noise can be a significant contribution to the overall noise problem. (2) Scale model investigations are an effective means of conducting helicopter noise research; however, more model/flight correlation studies are required to develop a high degree of confidence of the use of scale model results in the design process of helicopters. (3) More detailed investigations identifying critical factors affecting the main rotor/tail rotor noise mechanism are required. M.A.C.

N84-29670*# Boeing Vertol Co., Philadelphia, Pa.

ROLE OF EMPIRICAL METHODS

Harry Sternfeld *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 123-146 refs (For primary document see N84-29662 19-71)

Avail: NTIS HC A18/MF A01 CSCL 20A

There are different levels of helicopter noise prediction which may be appropriate at various stages in the design process. In the early preliminary design stages, when available information is usually limited to parameters such as gross weight, tip speed, forward speed, rotor radius, and possibly number of blades, one is limited to purely empirically based methodology. As the design progresses, and airfoil blade planforms and twists are defined, predictions of airloads, vortex paths, and compressibility effects may permit application of more analytically based sound pressure level prediction methods. At the present stage of development of first principle prediction methodology, however, the designer may still find it necessary to supplement such analyses with modifications based on empirical experience. Various causes and parameters of helicopter noise were identified and discussed from the standpoint of prediction. Rotational noise, blade-vortex interaction noise, thickness noise, broadband noise, and flyover noise were considered. A modular computer program for helicopter noise prediction (HELNOP) was described briefly. Wind tunnel models as useful tools in predicting full scale helicopter noise were also discussed. R.S.F.

N84-29671*# Hughes Helicopters, Culver City, Calif.

PRIORITY FOR EMPIRICAL METHODS DEVELOPMENT

Robert J. King *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 147-169 (For primary document see N84-29662 19-71)

Avail: NTIS HC A18/MF A01 CSCL 20A

Several noise sources combine to make up the total helicopter noise spectrum. The sources that are most important to community annoyance are the tail rotor (discrete), main rotor (unsteady), and engine (unsteady). The periodic and broadband noise components of the helicopter rotor were enumerated, and an approach to rotorcraft noise prediction was discussed. Helicopter noise sources were prioritized, and design improvements to reduce noise were reviewed. Main rotor noise is believed to be the key to quieter helicopters since there are proven and relatively inexpensive ways to handle the tail rotor. Blade Vortex Interaction (BVI) noise is a problem to some extent with all helicopters, particularly in the descent mode. Methodology must be developed to allow forecast and control of this type of noise. Additional means of controlling it, such as reduced rotor speeds for terminal operations should also be pursued because they may be the most effective means of control and they apply to all helicopter models. Main rotor broadband noise is the limiting factor in overall helicopter noise generation. Development of semi-empirical methods to predict its behavior is necessary if results are to be achieved in the short time period available. R.S.F.

N84-29672*# United Technologies Research Center, East Hartford, Conn. Aeroacoustics Group.

FACILITY REQUIREMENTS FOR HELICOPTER NOISE RESEARCH

Robert H. Schlinker and Danny R. Hoad (Army Structures Lab., Hampton, Va.) *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 171-202 refs (For primary document see N84-29662 19-71)

Avail: NTIS HC A18/MF A01 CSCL 20A

Development of future helicopter noise prediction methods requires an accurate experimental data base for correlation studies or assessment of theoretical prediction methods. The aerodynamic and acoustic performance criteria for conducting experimental studies of helicopter noise using existing test facilities were defined. Requirements for ground-based facilities were described in addition to the limitations associated with full scale and model scale studies. Flight testing methods were also evaluated briefly and the restrictions associated with these approaches were cited. Finally, a general evaluation of ground-based and flight testing methods is given. Based on this presentation, future investigators can select the experimental approach best suited for generating a desired data base. Also, facility improvements need to extend the state of the art in helicopter noise experimental studies so that problems can be identified. Author

N84-29673*# Bell Helicopter Co., Fort Worth, Tex. Acoustics Dept.

HIGH-SPEED NOISE OF HELICOPTER ROTORS

K. Rajarama Shenoy *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 203-218 refs (For primary document see N84-29662 19-71)

Avail: NTIS HC A18/MF A01 CSCL 20A

Various parameters of helicopter rotor noise were considered. Impulsive noise, flow regions of a helicopter rotor, noise prediction, aspect ratio, blade tip shape and speed, and blade-vortex

interaction noise were among the topics addressed. Recommendations were also given. R.S.F.

N84-29674*# Sikorsky Aircraft, Stratford, Conn. Acoustics Section.
ACOUSTIC METHODOLOGY REVIEW
Ronald G. Schlegel *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 219-244 (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

It is important for industry and NASA to assess the status of acoustic design technology for predicting and controlling helicopter external noise in order for a meaningful research program to be formulated which will address this problem. The prediction methodologies available to the designer and the acoustic engineer are three-fold. First is what has been described as a first principle analysis. This analysis approach attempts to remove any empiricism from the analysis process and deals with a theoretical mechanism approach to predicting the noise. The second approach attempts to combine first principle methodology (when available) with empirical data to formulate source predictors which can be combined to predict vehicle levels. The third is an empirical analysis, which attempts to generalize measured trends into a vehicle noise prediction method. This paper will briefly address each. B.W.

N84-29675*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PSYCHOACOUSTIC CONSIDERATIONS FOR HELICOPTER NOISE QUANTIFICATION: METRICS, HUMAN RESPONSE AND CRITERIA
C. A. Powell *In its* Rotorcraft Noise Jul. 1982 p 245-260 refs (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

The purpose of this paper is to examine several aspects of helicopter noise quantification from the standpoint of psychoacoustics. Noise metrics in common use to describe far-field aircraft noise and the noise characteristics which they consider are discussed. Some findings of recent psychoacoustic research related specifically to helicopter noise quantification are presented. Criteria for the accuracy of noise metrics to quantify helicopter noise are discussed. Finally, the prospects for improved metrics and research needed to develop and validate improved metrics or existing metrics are discussed. B.W.

N84-29676*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HELICOPTER ENGINE CORE NOISE
Uwe H. vonGlahn *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 261-284 refs (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

Calculated engine core noise levels, based on NASA Lewis prediction procedures, for five representative helicopter engines are compared with measured total helicopter noise levels and ICAO helicopter noise certification requirements. Comparisons are made for level flyover and approach procedures. The measured noise levels are generally significantly greater than those predicted for the core noise levels, except for the Sikorsky S-61 and S-64 helicopters. However, the predicted engine core noise levels are generally at or within 3 dB of the ICAO noise rules. Consequently, helicopter engine core noise can be a significant contributor to the overall helicopter noise signature. Author

N84-29677*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ROTORCRAFT NOISE PREDICTION
William E. Zorumski *In its* Rotorcraft Noise Jul. 1982 p 291-308 refs (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

The purpose of this presentation is to give a general strategy for rotorcraft noise prediction. This strategy is expressed through a modular software system design rather than theoretical analysis of the aerocoustic phenomena. The crucial design choices in a software system design are the module interface definitions. An interface is the data that are passed from one module to another. A module takes data from one (input) interface and transforms it, through a prediction method, to another (output) interface. In system design, the method is less important than the interface. The two types of methods available may be broadly classified as empirical or analytical, although no method is purely one or the other. These two general approaches will be compared as they apply to rotorcraft noise prediction. Author

N84-29678*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ROTOR NOISE PREDICTION TECHNOLOGY: THEORETICAL APPROACH
F. Farassat *In its* Rotorcraft Noise Jul. 1982 p 309-318 (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

Helicopter rotors which are the most complicated noise generators among rotating blade machinery are discussed. The main or the tail rotor can be the dominant source of noise depending on the range of frequencies and the observer position. Significant advances in noise prediction were made. Acoustic analysis is the most successful and general theoretical method to treat the acoustics of helicopter noise. The aerodynamic approach is used to study nonlinear acoustic effects. The results of acoustic analogy depend greatly on the input data. E.A.K.

N84-29679*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIMENT VERSUS THEORY
Frederic H. Schmitz, Yung H. Yu, and Don A. Boxwell *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 319-330 refs Prepared in cooperation with Army Armament Research and Development Command, Moffett Field, Calif. (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

High speed compressibility noise and vortex interaction noise, which are aerodynamically generated noise sources, were investigated. Noise generating mechanisms were identified. Linear and nonlinear theory were compared and are in agreement with data on amplitude and wave forms. The interaction area between the acoustic planform and blade/vortex interaction lines are examined. E.A.K.

N84-29680*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AERODYNAMIC PREDICTION I
Wayne Johnson *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 331-356 refs (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

The aerodynamic prediction methodology which is needed for rotor noise calculations is presented. Airloads and wakes, dynamic stall, compressible flow, and random loads are reviewed. The aerodynamics/acoustics interface is defined when the noise or measurements are considered. The classical approach involving a distinct separation of aerodynamic sources and acoustic propagation is the basis of most rotor noise calculations. Aeroacoustics of rotors involve unique features which are not encountered in other aerodynamic problems of rotors: (1) acoustics problems ultimately require only an order of magnitude estimate of the sound pressure field, consequently remarkably good noise predictions are obtained from very simple aerodynamic analyses; (2) aeroacoustics introduce an interest in the higher frequency aerodynamics, the deterministic aerodynamic phenomena are still low frequency, however, the high frequency noise comes from the acoustic propagation; and (3) the aerodynamic phenomena on rotors that are only of interest due to the noise they produce, are the random aerodynamic pressures on the blades. E.A.K.

N84-29681*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AERODYNAMIC PREDICTIONS II

Michael E. Tauber *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 357-373 ref (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

The development of technology to aid in the design of advanced rotor blades to improve both aerodynamic and acoustic performance is discussed. The development of advanced computer codes to calculate the subsonic and transonic flow field about rotor blades and to model such high noise producing phenomena as shock waves and blade/vortex interaction is examined. The codes are verified by comparison with experimental data. Making the codes available to industry and to provide some training for the industrial users is emphasized. E.A.K.

N84-29682*# Sikorsky Aircraft, Stratford, Conn. Acoustics Dept.
STATE OF THE ART: DESIGN FOR NOISE I
David S. Jenny *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 375-395 (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

The engineering management strategy involved in designing helicopters to meet a noise requirement is discussed. A different perspective is given on how designs were accomplished in the past, how a new design would be carried out today, and how knowledge gained through acoustics R&D will have two important effects. It will lead to invention of quieter features to be incorporated, and it will improve the ability to predict accurately the noise levels of new designs before they are built. Each of these effects changes the basic design process. R.J.F.

N84-29683*# Bell Helicopter Co., Fort Worth, Tex. Acoustics Dept.
STATE OF THE ART: DESIGN FOR NOISE II
C. R. Cox *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 397-404 (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

Charts relating to helicopter noise reduction design efforts are given. Information regarding priorities, design guidelines, design margins, risks, noise prediction, derivative trends, design impact, and cost impact is given. R.J.F.

N84-29684*# Hughes Helicopters, Culver City, Calif.
A DESIGNER'S VIEWPOINT: REQUIREMENTS FOR REDUCING HELICOPTER NOISE
Edwin E. Cohen *In* NASA. Langley Research Center Rotorcraft Noise Jul. 1982 p 405-413 (For primary document see N84-29662 19-71)
Avail: NTIS HC A18/MF A01 CSCL 20A

Functional requirements of helicopter noise reduction are discussed from the work environment point by view, i.e., what conditions must exist before the designer can take aim, without too many restraints, at reducing noise, community demand for noise reduction, regulatory requirements, competition, and penalties are among the topics discussed. R.J.F.

N84-29685*# Kansas Univ., Lawrence. Flight Research Lab.
GENERAL AVIATION AIRCRAFT INTERIOR NOISE PROBLEM: SOME SUGGESTED SOLUTIONS
Jan. Roskam and Ramasamy Navaneethan Jun. 1984 488 p refs
(Contract NCCI-6)
(NASA-CR-173784; NAS 1.26:173784; KU-FRL-417-23) Avail: NTIS HC A21/MF A01 CSCL 20A

Laboratory investigation of sound transmission through panels and the use of modern data analysis techniques applied to actual aircraft is used to determine methods to reduce general aviation interior noise. The experimental noise reduction characteristics of stiffened flat and curved panels with damping treatment are discussed. The experimental results of double-wall panels used in the general aviation industry are given. The effects of skin panel material, fiberglass insulation and trim panel material on the noise reduction characteristics of double-wall panels are investigated. With few modifications, the classical sound transmission theory can be used to design the interior noise control treatment of aircraft. Acoustic intensity and analysis procedures are included. M.A.C.

N84-29686*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECT OF BOATTAIL GEOMETRY ON THE ACOUSTICS OF PARALLEL BAFFLES IN DUCTS
Paul T. Soderman, Gregory Unnever (USAF, Wright-Patterson AFB, Ohio), and Michael R. Dudley Jul. 1984 18 p refs
(NASA-TM-85981; A-9813; NAS 1.15:85981) Avail: NTIS HC A02/MF A01 CSCL 20A

Sound attenuation and total pressure drop of parallel duct baffles incorporating certain boattail geometries were measured in the NASA Ames Research Center 7- by 10-Foot Wind Tunnel. The baseline baffles were 1.56 m long and 20 cm thick, on 45-cm center-to-center spacings, and spanned the test section from floor to ceiling. Four different boattails were evaluated: a short, smooth (nonacoustic) boattail; a longer, smooth boattail; and two boattails with perforated surfaces and sound-absorbent filler. Acoustic measurements showed the acoustic boattails improved the sound attenuation of the baffles at approximately half the rate to be expected from constant-thickness sections of the same length; that is, 1.5 dB/n, where n is the ratio of acoustic treatment length to duct passage width between baffles. The aerodynamic total pressure loss was somewhat sensitive to tail geometry. Lengthening the tails to reduce the diffusion half-angle from 11 to 5 degrees reduced the total pressure loss approximately 9%. Perforating the boattails, which increased the surface roughness, did not have a large effect on the total pressure loss. Aerodynamic results are compared with a published empirical method for predicting baffle total pressure drop. Author

N84-29687*# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
PROPELLER AIRCRAFT INTERIOR NOISE MODEL
L. D. Pope, E. G. Wilby, and J. F. Wilby Jul. 1984 158 p refs
(Contract NAS1-15782)
(NASA-CR-3813; NAS 1.26:3813; BBN-5058) Avail: NTIS HC A08/MF A01 CSCL 20A

An analytical model was developed to predict the interior noise of propeller-driven aircraft. The fuselage model is that of a cylinder with a structurally-integral floor. The cabin sidewall is stiffened by stringers and ring frames, and the floor by longitudinal beams. The cabin interior is covered with a sidewall treatments consisting of layers of porous material and an impervious trim septum. Representation of the propeller pressure field is utilized as input data in the form of the propeller noise signature at a series of locations on a grid over the fuselage structure. Results obtained from the analytical model are compared with test data measured by NASA in a scale model cylindrical fuselage excited by a model propeller. Author

N84-29688# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mathematical Sciences.
INFLUENCE OF HORIZONTALLY-RANDOM BOTTOM STRUCTURE ON ACOUSTIC INTENSITY IN A SHALLOW OCEAN
M. J. Jacobson, W. L. Siegmann, and C. E. Ashley 15 Apr. 1984 43 p
(Contract N00014-76-C-0288)
(AD-A141383; RPI-142) Avail: NTIS HC A03/MF A01 CSCL 20/1

Effects of a model for random bottom structure on acoustic intensity in isospeed shallow water are studied. The randomness is due to stochastic variations in the bottom density and sound speed in the horizontal direction beneath a plane water-bottom interface. Ray geometry, spreading loss, and bottom loss and phase shift are examined in order to derive formulas for mean intensity and the variance of intensity. The expressions obtained are sufficiently general to permit their use with different bottom-acoustic models of sound reflection. In this paper, for illustrative and comparative purposes two such models, one developed by MacKenzie and the other by Rayleigh, are considered. The

distinctive acoustic consequences of bottoms of different density mean, variance, and horizontal correlation are discussed, as are comparisons of results for the two bottom-reflection models. Intensity moments are obtained also for differing source-receiver range and water depth. GRA

N84-29689# General Electric Co., Syracuse, N.Y. Electronics Lab.
ACOUSTO-OPTIC ADAPTIVE PROCESSING (AOAP) Phase Report, Sep. 1981 - Oct. 1982
W. A. Penn, D. R. Morgan, A. Aridgides, and M. L. Noble Griffiss AFB, N.Y. RADC Dec. 1983 187 p
(Contract F30602-81-C-0264; AF Proj. 4506)
(AD-A141445; RADC-TR-83-156) Avail: NTIS HC A09/MF A01 CSCL 20/1

The conventional approach for implementing adaptive cancellers to reject radar interference is to build a separate electronic loop for each required degree of freedom. The process consists of cross-correlating the radar signal with interference samples received by wide-beamwidth auxiliary antennae. These correlation values are then used to adjust the interference waveforms in amplitude and phase so that a precise subtraction of the offending interference can be accomplished. An optical implementation of such a processor is the subject of the effort described in this report. In the optical configuration which has been developed, the required operations of multiplication and time delay are provided by acousto-optical (AO) delay lines. The required time integration is provided by an image converter having a suitable delay time. In the optical realization, each resolvable optical element along the AO delay lines used as input modulators represents an additional delay time degree of freedom. Thus we find a continuum of correlation weights developed spatially along the delay line. The optical dimension transverse to the direction of acoustic propagation can be used to provide another array dimension. GRA

N84-29690# IBM Research Lab., San Jose, Calif.
PULSED-LASER GENERATION OF ULTRA-SHORT ACOUSTIC PULSES: APPLICATION FOR THIN-FILM ULTRASONIC MEASUREMENTS
A. C. Tam 18 May 1984 19 p
(Contract N00014-83-C-0170)
(AD-A141874; RJ-4306; TR-8) Avail: NTIS HC A02/MF A01 CSCL 20/1

We demonstrate opto-acoustic generation and detection of acoustic pulses of 1 nanosecond duration in condensed matter. Such opto-acoustic pulses are at least one order of magnitude shorter than those previously reported. These narrow acoustic pulses find new application for thin-film pulse measurement which are not possible with conventional transducer techniques. Round trip echo times are measured to 1% accuracy for stainless steel films of 12 micron thickness. This provides a new high accuracy thickness measurement in a pulsed mode. Untrasonic attenuation for the narrow acoustic pulses are very large and are also measured. Author (GRA)

N84-29691# Department of the Navy, Washington, D. C.
SYNTHESIS OF ARBITRARY BROADBAND SIGNALS FOR A PARAMETRIC ARRAY Patent Application
S. Singhal and J. G. Zornig, inventors (to Navy) Filed 21 Jul. 1983 24 p
(AD-D011021; US-Patent-Appl-SN-516013) Avail: NTIS HC A02/MF A01 CSCL 17/1

A method for synthesizing arbitrary broadband signals for a parametric array which computes the input waveform needed to a parametric array source to obtain a received signal of a prescribed waveform. The method uses Fourier transform and the inverse transform of digitized received signal in order to make computation in either the frequency domain or the time domain depending upon the computational simplicity in a particular domain. The method uses a iterative process to obtain the received signal very close to the received signal of the desired waveform. Author (GRA)

N84-29692# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
SIMULATION PROCEDURE FOR THE CALCULATION OF AIRCRAFT NOISE [SIMULATIONSVERFAHREN ZUR BERECHNUNG VON FLUGLAERM]
O. Bschorr, H. Melzer, and R. Woelk 1983 4 p
Avail: NTIS HC A02/MF A01

A procedure for the calculation of aircraft noise, especially of noise distributions at airports, was developed. The air traffic is directly simulated in the computer. Flight trajectories are discretized in a close meshed series of emission points to calculate noise evolution. Aircraft directional characteristics and meteorological conditions, especially ray curvature due to wind and temperature gradients, are taken into account. This procedure gives a real time histogram of the noise, comparable to an in situ measurement. Author (ESA)

N84-29693# Southampton Univ. (England). Inst. of Sound and Vibration Research.
[ACTIVITIES REPORT OF THE INSTITUTE OF SOUND AND VIBRATION RESEARCH] Annual Report, Mar. 1984
Mar. 1984 47 p refs
Avail: NTIS HC A03/MF A01

Research concerning noise and vibration control, automotive engineering design, auditory communication and hearing conservation, and structural shock analysis is described. Author (ESA)

N84-28858# Joint Publications Research Service, Arlington, Va.
UNBALANCED INFRARED RADIATION AND NATURAL LASER EFFECT IN ATMOSPHERES OF VENUS AND MARS Abstract Only
B. F. Gordiyets and V. Y. Panchenko *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 81-82 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 929-939 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-29466*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DEFINITIONS OF NOISE AND NOISE POLLUTION
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 1-3 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 20A

N84-29467*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PHYSICAL MEASURES OF SOUND AND NOISE
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 5-24 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 20A

N84-29477*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GUIDELINES FOR ASSESSMENT AND CONTROL OF NOISE
In its Physiol., Psychol., and Social Effects of Noise Jul. 1984 p 607-646 refs (For primary document see N84-29465 19-54)
Avail: NTIS HC A99/MF A01 CSCL 20A

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N84-29694# Library of Congress, Washington, D. C. Science Reference Section.
QUARKS
Vivian O. Sammons, comp. Sep. 1983 9 p
(TB-83-7; ISSN-0090-5232) Avail: NTIS HC A02/MF A01

A guide to the available literature on quarks in the collections of the Library of Congress is provided. Some basic texts, state-of-the-art reviews and conferences, and journal articles are listed. M.G.

N84-29695# California Univ., Irvine. Dept. of Chemistry.
INTERNATIONAL CONFERENCE ON RADIATIONLESS TRANSITIONS Final Report, 1 Jan. - 31 Dec. 1984
E. K. C. Lee, F. S. Rowland, and M. Wolfsberg 31 Dec. 1984 17 p Conf. held at Newport Beach, Calif., 3-7 Jan. 1984
(Contract N00014-83-G-0178)
(AD-A141407) Avail: NTIS HC A02/MF A01 CSCL 07/5

International Conference on Radiationless Transitions was held at the Hotel Newporter, Newport Beach, California, on January 3-7, 1984. Thirty long invited talks (30-20 minutes), 13 short talks (15-10 minutes), and 26 poster papers were presented. Topics presented in 9 half-day sessions (besides 2 poster sessions) were laser multiphoton ionization, photo dissociation dynamics, theories on intramolecular dynamics, gas phase relaxation dynamics, condensed phase dynamics and laser-jet spectroscopy. The international scientists totaling 111 had exchanged recent scientific information and generated new ideas for future research with intense participation during the conference. GRA

N84-29696# Naval Research Lab., Washington, D. C.
INFLUENCE OF COLLISIONS ON THE MAGNETIZED ION-ION INSTABILITY Memorandum Report, Oct. 1983 - Oct. 1984
J. D. Huba 30 Apr. 1984 24 p
(AD-A141464; NRL-MR-5296) Avail: NTIS HC A02/MF A01 CSCL 20/8

A preliminary investigation of collisional effects on the magnetized ion-ion instability is made. It is found that ion-neutral collisions have a stabilizing influence in that they stabilize all growing modes for sufficiently large collision frequencies. On the other hand, electron-ion collisions have a destabilizing influence in that modes that are stable in the collisionless regime can be unstable because of electron-ion collisions. Applications of these results to the DNA/NRL laser experiment are discussed.
Author (GRA)

N84-29697# Massachusetts Inst. of Tech., Cambridge. Center for Materials Science and Engineering.
ITERATIVE COUPLING OF PARTITIONED CLUSTERS IN THE SCATTERED-WAVE MOLECULAR-ORBITAL METHOD Interim Report
F. A. Leon and K. H. Johnson 15 May 1984 20 p
(Contract N00014-81-K-0499)
(AD-A141522; TR-7) Avail: NTIS HC A02/MF A01 CSCL 07/4

The iterative coupling technique is described and applied to the partitioned self-consistent-field X-alpha scattered-wave method. This technique allows the electronic coupling of a central cluster of atoms to its environment to be calculated iteratively, permitting scattered-wave molecular-orbital calculations to be performed on larger clusters than was previously possible. A test calculation on methanol is reported. Author (GRA)

N84-29698# Air Force Academy, Colo.
MINDO/3 AND MNDO CALCULATIONS FOR NITRO COMPOUNDS Progress Report, 1 Jan. 1982 - 31 Oct. 1983
R. M. Guidry and L. P. Davis 13 Jan. 1984 49 p
(AF Proj. 2303)
(AD-A141727; FJSRL-TR-83-0012) Avail: NTIS HC A03/MF A01 CSCL 07/4

The semiempirical molecular orbital calculational methods MINDO/3 and MNDO were compared to each other and to available experimental data for a number of nitroaliphatic and nitroaromatic compounds. In general, MINDO/3 predicted heats of formation, dipole moments ionization potentials better than MNDO. MNDO, however, predicted molecular geometries slightly better than MINDO/3 although both methods gave good estimates of the structural parameters. Author (GRA)

N84-29699# Battelle Columbus Labs., Ohio.
MOLECULAR ORDER AND SOLIDIFICATION PROCESSES IN ORGANIC LIQUIDS AND SOLUTIONS Final Scientific Report
R. J. Jakobsen and J. W. Brasch 15 Jan. 1984 11 p
(Grant AF-AFOSR-0166-80; AF Proj. 2303)
(AD-A141777; AFOSR-84-0425TR) Avail: NTIS HC A02/MF A01 CSCL 11/8

Purpose of this program was to study behavior of lubricants subjected to high temperatures and pressures as in ball bearings. Solutions of organic acids in hydrocarbons were selected as prototype lubricants and a diamond anvil high pressure cell was used for the observations. Short and long range order studies: Past studies have indicated the possibility of aggregation of acid molecules at high, but constant pressure. In order to check this observation, equipment was needed to precisely and to rapidly obtain both pressure measurements and infrared spectra. Accordingly, a combination microscope and beam condenser stage for the high pressure cell was constructed. We determined that at high pressure acid aggregation was occurring, but the pressure measurements indicated that the pressure was slightly increasing, probably due to gasket extrusion. Thus the increased hydrogen bonding or aggregation was a result of this slight pressure increase. Long range order was tested by means of polarized infrared spectra. No changes in the dichroic ration were detected indicating no evidence of long range order. Kinetic and reaction mechanism studies showed a small amount of monomer formation at elevated temperatures. Only after monomer appeared did salt formation commence and then the rate of organic salt formation appeared to be proportional to the rate of monomer formation, indicating that salt was formed from the monomer. GRA

N84-29700# Naval Postgraduate School, Monterey, Calif.
CERENKOV RADIATION GENERATED BY PERIODIC ELECTRON BUNCHES IN A FINITE AIR PATH M.S. Thesis
L. A. Newton Dec. 1983 63 p
(AD-A142063) Avail: NTIS HC A04/MF A01 CSCL 20/8

Microwave Cerenkov radiation is measured for the case of bunched electron beams which exceed the velocity of light in a finite air path. The theoretical equation for prediction of the form of the power for Cerenkov radiation is tested experimentally for this case. Initial verification of the theory is observed.
Author (GRA)

N84-29701# SRI International Corp., Menlo Park, Calif.
DIAGNOSTICS DEVELOPMENT FOR E-BEAM EXCITED AIR CHANNELS: OPTICAL STUDIES OF THE PHERMEX ELECTRON BEAM Technical Report
D. J. Eckstrom and J. S. Dickinson 20 Mar. 1984 23 p
(Contract N00014-81-C-0208; ARPA Order 4128)
(AD-A142095; AD-F300432; TR-4) Avail: NTIS HC A02/MF A01 CSCL 20/8

Electron-induced fluorescence at selected UV wavelengths from the air channel excited by the PHERMEX electron beam facility at LANL was studied. Each beam pulse consisted of a sequence of 10 micropulses of 26 meV electrons of 200 A peak current lasting 3 ns. Individual micropulses were measured and analyzed. The 391.4-nm first negative emission from N2+ was linear with beam current for all micropulses at all pressures. Thus, this emission band serves as an optical Faraday cup under these conditions. The 406.0-nm N2 second positive emission exhibited enhancements due to self-induced electric fields at pressures below 50 torr. The vibrational temperatures in the air channel rose during each pulse train to values ranging from about 750 to 1400 K. Very limited data indicates that the rotational temperature stays constant at approximately 300 K. Emission measurements made 20-m off the beam axis indicate that the induced intensity decays rapidly with propagation distance (30-50% in 6 meters). This suggests a much faster dissipation of beam energy than suggested deposition calculations. We observed no evidence for super radiant emission during tests at 580 torr. Author (GRA)

N84-29702# Harvard Univ., Cambridge, Mass. Dept. of Physics.
MEASUREMENT OF LIFETIMES OF THE VIBRATIONAL LEVELS OF THE B STATE OF N2 Final Report, 1 Apr. 1982 - 30 Sep. 1983
F. M. Pipkin 21 Jan. 1984 39 p
(Contract F19628-82-K-0037)

(AD-A142161; AFGL-TR-84-0068) Avail: NTIS HC A03/MF A01 CSCL 20/8

This report summarizes two series of investigations of molecular nitrogen. In the first series of experiments the lifetimes of selected levels of the B 3 pi g state of N2 were measured. A chopped CW dye laser beam was employed to excite selected levels of the B 3 pi g state of N2 in a beam of molecules in the A 3 sigma + u metastable state. Laser induced fluorescence was observed from the vibrational levels nu = 5 through nu = 12, and a photomultiplier was used in conjunction with a microcomputer system to measure the time dependence of the decay light. The lifetimes which were measured to an accuracy of 3% showed a smooth decline from 5.8 microsec for nu = 5 to 4.11 microsec for nu = 12. No dependence on rotational level was observed. In the second series of experiments an attempt was made to produce a beam of metastable N2 molecules in the a 1 sigma + g state, use a dye laser to excite them to the c4(o)1 pi u and c'5(o)1 sigma + u metastable states, and observe the fluorescent radiation.

Author (GRA)

N84-29703# Naval Research Lab., Washington, D. C.
HIGH CURRENT INDUCTION ACCELERATORS
C. A. Kapetanakos and P. A. Sprangle 12 Jun. 1984 31 p
(AD-A142303; AD-E750179; NRL-MR-5259) Avail: NTIS HC A03/MF A01 CSCL 20/7

High energy accelerators capable of producing high current electron beams are rapidly becoming an active area of research. The main development effort is currently being focused on induction accelerators. As a result of their inherent low impedance, these devices are ideally suited for generating intense beams. If this high current branch of accelerator technology is successful, it may have some very profound implications, far beyond the research laboratories.

Author (GRA)

N84-29704# Department of the Navy, Washington, D. C.
IN-LINE, CONCURRENT ELECTROMAGNETIC BEAM ANALYZER Patent Application
F. M. Mako and J. A. Pasour, inventors (to Navy) Filed 16 Feb. 1984 15 p
(AD-D011040; US-Patent-Appl-SN-580921) Avail: NTIS HC A02/MF A01 CSCL 20/6

This invention relates generally to electromagnetic radiation technology and more specifically to electromagnetic beam diagnostics. An in-line concurrent diagnostic analyzer for laser beams is described. An aperture mirror splits the initial laser beam into two beams. The reflected portion of the initial beam follows path 1. Along path 1, an aliquot of the path 1 beam is reflected into a time history sensor. The majority of the path 1 beam ignites a plasma to mark beam arrival time at the target. The apertured beam strikes and heats a calorimeter mirror, which records the energy of the incident beam. About 99 percent of the apertured beam then passes to a specially designed (thin, with a short diffusion time) mirror attached to thermocouples to record the energy profile of the beam. The beam is reflected by the special mirror onto the target. A third sensor detects any breakdown at the target surface.

GRA

N84-29705# Nebraska Univ., Lincoln.
HYPERSPHERICAL COORDINATE THEORY OF 2 ELECTRON ATOMIC PROCESSES Progress Report, 1 Aug. 1983 - 31 Jul. 1984
Joseph Macek and Anthony F. Starace Mar. 1984 16 p refs
(Contract DE-AC02-82ER-12081)
(DE84-009447; DOE/ER-12081/5) Avail: NTIS HC A02/MF A01

Electron correlations are studied in two-electron atoms using theoretical methods employing hyperspherical coordinates. The doubly differential cross section for detachment of H(-) by impact with He is studied using adiabatic hyperspherical coordinate initial and final state wavefunctions to compute the H(-) form factors. The detached electron's angular distribution is highly sensitive to electron correlations. A pseudo-state method is developed to correct the gross inaccuracies of adiabatic hyperspherical wavefunctions at large radial distances. This procedure yields significantly improved (1)S elastic phase shifts for electron scattering on atomic hydrogen. The Fock series expansion for two electron wavefunctions has been successfully implemented numerically. When matched to single channel adiabatic functions for some radius R0, the Fock wavefunctions or He and H(-) differ little (for $O < R < R0$) from the adiabatic wavefunctions, at least for the lowest adiabatic channels. This confirms recent results of Christensen-Dalsgaard. The R-matrix for systems of coupled differential equations containing first derivative coupling matrix elements is found to be asymmetric.

DOE

N84-29706# Fermi National Accelerator Lab., Batavia, Ill.
WIDTH OF NONLINEAR RESONANCE
S. Ohnuma Mar. 1984 2 p refs
(Contract DE-AC02-76CH-03000)
(DE84-009862; FERMILAB/TM-1247) Avail: NTIS HC A02/MF A01

Two approximations are made, one essential and the other not so essential but convenient to keep the analytical treatment manageable: (1) Only one nonlinear resonance is considered at a time so that the treatment is best suited when the tune is close to one resonance only. To improve this approximation, one must go to the next order which involves a canonical transformation of dynamical variables. Analytical treatment of more than one resonance is not possible for general cases. (2) In the formalism using the action-angle variables, the Hamiltonian can have terms which are independent of the angle variables. These terms are called phase-independent terms or shear terms. The tune is then a function of the oscillation amplitudes. In the lowest-order treatment, the (4N)-pole components but not the (4N + 2)-pole components contribute to this dependence. In deriving the resonance width analytically, one ignores these terms in the Hamiltonian for the sake of simplicity. If these are retained, one needs at least three extra parameters and the analytical treatment becomes rather unwieldy.

DOE

N84-29707# Naples Univ. (Italy).
RELATIVISTIC PARTICLE DYNAMICS: LAGRANGIAN PROOF OF THE NO-INTERACTION THEOREM
G. Marmo, N. Mukunda (Indian Inst. of Science, Bangalore), and E. C. G. Sudarshan (Texas Univ., Austin) Nov. 1983 15 p refs
(Contract DE-AS05-76ER-03992)
(DE84-009147; DOE/ER-03992/538) Avail: NTIS HC A02/MF A01

An economical proof is given, in the Lagrangian framework, of the No Interaction Theorem of relativistic particle mechanics. It is based on the assumption that there is a Lagrangian, which if singular is allowed to lead at most to primary first class constraints. The proof works with Lagrange rather than Poisson brackets, leading to considerable simplifications compared to other proofs.

DOE

N84-29708# Tennessee Univ., Knoxville.
DIFFERENTIAL CHARGE TRANSFER AND CONTINUUM ELECTRON CAPTURE STUDIES FOR IONS IN ATOMIC HYDROGEN Final Report, 1 Aug. 1979 - 31 Sep. 1983
Ivan A. Sellin and Stuart B. Elston 1983 8 p refs
(Contract DE-AS05-79ER-10512)
(DE84-009675; DOE/ER-10512/4) Avail: NTIS HC A02/MF A01

A final technical narrative is given of progress and results obtained during the period August 1, 1979 through September 30, 1983 in a project designed to test existing theories of electron capture to continuum states of fully stripped nuclei traversing atomic hydrogen targets.

DOE

N84-29709# Fermi National Accelerator Lab., Batavia, Ill.
HOW MUCH RANDOM SEXTUPOLE FIELD CAN WE HAVE IN THE PRESENCE OF BEAM-BEAM INTERACTIONS
S. Ohnuma Feb. 1984 2 p
(Contract DE-AC02-76CH-03000)
(DE84-009867; FERMILAB/TM-1246) Avail: NTIS HC A02/MF A01

During the workshop, two estimates of the random sextupole

components in the SSC dipoles were presented, one from Berkeley and the other from Brookhaven. The resulting resonance width 2 epsilon/sub G/ is calculated for four third-integer resonances using the lattice designed by the Berkeley group. In order to compare the width with the results from CERN Sp anti p s beam studies the CERN-style emittance corresponding to 2 sigma (86.5%) was used instead of (RADICAL)6 sigma (96%). DOE

N84-29710# Argonne National Lab., Ill.
DATA NEEDS FOR THE TRACK STRUCTURE OF ALPHA PARTICLES AND ELECTRONS IN WATER
A. Pagnanenta 1983 4 p refs Presented at Agr. Electron.: 1983 and Beyond Conf., Chicago, 11 Dec. 1983
(Contract W-31-109-eng-38)
(DE84-009154; CONF-831254-3) Avail: NTIS HC A02/MF A01

The ionization spectra for alpha particle and electron tracks in water were calculated. The number of ions created per micrometer of length, the energy distribution of the secondaries, and the energy expended per ion pair created were also determined in order to obtain a numerically accurate description of the track structure at all energies in a form suitable for biomedical applications. DOE

N84-29711# Georgia Univ., Athens. Dept. of Physics and Astronomy.
QUANTUM MECHANICAL STUDIES OF HEAVY ION SCATTERING PROCESSES Progress Report, 15 Jul. 1983 - Mar. 1984
T. G. Heil 15 Mar. 1984 10 p refs
(Contract DE-AS09-83ER-13098)
(DE84-010124; DOE/ER-13098/1) Avail: NTIS HC A02/MF A01

Low energy atomic collision process using molecular states formed by the collision partners in the interaction region are described. On the most basic level, a new diabatic representation of the scattering which has none of the defects associated with the most commonly used formulation of Smith was developed. This may prove to be of great importance since a proper diabatic description is thought to be a more reasonable representation of the actual physical scattering process than the adiabatic description. A great deal of controversy surrounds the word proper but the new formulation satisfies most, if not all, criteria for diabatic states. In addition, theoretical studies on a number of atomic scattering processes involving charge transfer reactions and proton-induced fine structure transitions were carried out. Calculations of differential scattering cross sections for low energy charge transfer reaction should be of particular importance. A number of experimental groups are now proposing to measure these cross sections which our calculations predict should have large, striking features. Such comparisons would provide valuable tests of the theory of low energy atomic collision processes on a more fundamental level than previous comparisons of the total cross sections. DOE

N84-29712# Clemson Univ., S.C. Dept. of Physics and Astronomy.
ATTRACTIVE INTERACTION BETWEEN AN ATOM AND A SURFACE
J. R. Manson and R. H. Ritchie (ORNL) 1983 16 p refs Presented at Intern. Conf. on Atomic Collisions in Solids, Bad Iburg, West Germany, 18 Jul. 1983
(Contract W-7405-eng-26)
(DE84-003204; CONF-830780-4) Avail: NTIS HC A02/MF A01

A general self energy formalism is used to examine the interaction between an atom and a surface. Deviations from the Van der Waals force due to recoil and finite velocity of the particle are considered. Calculations for positronium near a metal surface show that for such systems recoil and velocity effects are significant even at very low energies. The mechanisms for energy exchange with the surface were studied. Calculations show that single quantum events do not always dominate the exchange rates. DOE

N84-29713# Brookhaven National Lab., Upton, N. Y.
APERTURE STUDIES OF THE BNL COLLIDING BEAM ACCELERATOR WITH REDUCED SUPERPERIODICITY
G. F. Dell 1983 7 p refs Presented at the Computing in Accelerator Design and Operation Conf., Geneva, 20 Sep. 1983
(Contract DE-AC02-76CH-00016)
(DE84-002854; BNL-33741; CONF-8309226-1) Avail: NTIS HC A02/MF A01

Chromatic properties of the Brookhaven CBA (Colliding Beam Accelerator) with one low (BETA) insertion in each of the three superperiods were studied using the PATRICIA particle tracking program. Systematic multipoles of order 5 < n less than or equal to 10 as well as random multipoles of order 1 less than or equal to 10 are along with random closed orbit errors and effects, included when determining the aperture of the lattice. DOE

N84-29714# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Werner-Heisenberg Institut fuer Physik.
[ACTIVITIES REPORT OF THE WERNER-HEISENBERG INSTITUTE OF PHYSICS] Annual Report, 1983 [JAHRESBERICHT 1983]
Dec. 1983 169 p refs In GERMAN Original contains color illustrations
(ISSN-0173-6256) Avail: NTIS HC A08/MF A01

Experiments performed at CERN are described: interaction of neutrons and antineutrons with protons and neon-nuclei; a beam-dump experiment, hadron-hadron reactions, lepton-nucleon scattering, development of a holographic high pressure stream chamber. Experiments were performed at the electron-positron storage ring with the CELLO detector. Data acquisition, data processing, and electronic systems were developed for these experiments. Charms were investigated in hadronic interaction; semiconductor detectors were developed; an experiment was conducted at the electron-positron storage ring CESR with the CUSB detector. Unitied field theories; quark, leptons and phenomenological models; characteristics of calibration theories; supersymmetry and supergravitation; neutrino-astronony and magnetic monopoles; quantum mechanics and geometric quantization; nonrelativistic many particle physics were studied. Author (ESA)

N84-29346*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RADIATION DAMAGE WORKSHOP
Paul M. Stella *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 253-254 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 20H

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N84-29715# State Univ. of New York, Albany. Dept. of Physics.
HIGH ENERGY CHANNELING AND ITS APPLICATIONS Progress Report, 1 Nov. 1982 - 30 Oct. 1983
W. M. Gibson and C. R. Sun Nov. 1983 10 p refs
(Contract DE-AC02-78ER-05001)
(DE84-007251; DOE/ER-05001/T1) Avail: NTIS HC A02/MF A01

Results on the steering of the particles at Fermilab energies through bent single silicon crystals will be described. Study of the data taken at 8.4 GeV at Dubna has led to the evaluation of normal dechanneling in silicon crystal. Detail study of channeling radiation at 2, 4, 6 and 10 GeV positrons has resolved previously existed differences between theory and experiment. Angular distributions studies are in progress. Radiation damage on Si crystals used in high energy channeling experiments showed remarkable promise. DOE

N84-29716# Chicago Univ., Ill. Dept of Physics.
THEORETICAL HIGH ENERGY PHYSICS RESEARCH Technical Progress Report
Jonathan L. Rosner 1984 17 p refs
(Contract DE-AC02-82ER-40073)
(DE84-009785; DOE/ER-40073/2) Avail: NTIS HC A02/MF A01

Research activities are briefly reported in the areas of quarkonium physics, e(+-) annihilations, neutral heavy leptons, magnetic monopoles, heavy vector bosons beyond the W and Z, supersymmetry, branching ratios in proton decay, and baryon magnetic moments publications are listed. DOE

74 OPTICS

Includes light phenomena.

N84-29717# New South Wales Univ., Sydney (Australia).
THE PRODUCTION AND EVALUATION OF HIGH-STRENGTH OPTICAL FIBRE Ph.D. Thesis
Francis A. Donaghy Mar. 1982 294 p refs
Avail: NTIS HC A13/MF A01

Practical aspects of the fabrication of optical fibers, with emphasis on optimization of their mechanical properties and an experimental evaluation of these properties are presented. The design and construction of an optical fiber drawing tower is described. A method of applying a protective primary coating of silicone resin concentrically to the fiber was developed and its operation justified on theoretical grounds. Experimental measurements of the centering forces on fibers, created by hydrodynamic drag effects in tapered coating dies, are presented, and found to be in general significantly smaller than theoretically predicted. This is partially explained by non-Newtonian resin viscosity. B.G.

N84-29718# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
OPTICAL ADAPTIVE FILTER. FREQUENCY DOMAIN IMPLEMENTATION M.S. Thesis
Jeffrey L. Newman Dec. 1983 201 p
(AD-A141090; AFIT/GE/EE/83D-51) Avail: NTIS HC A10/MF A01 CSCL 20/6

This report presents the results of a feasibility test on an optical adaptive filter, implemented in the frequency domain. The OAFFI is the follow-on to the optical adaptive filter, which was implemented in the time domain. The theory of OAFFI is based on adaptive linear predictions using correlation cancellation loops and optical signal processing (OSP) using Fourier optics (lenses) and acousto-optics (Bragg cells). A few optical architectures, which form the fundamental building blocks of OAFFI, were built and examined prior to the OAFFI architectures. These fundamental architectures included an Optical Spectrum Analyzer, Optical Excisor (two versions) and a Liquid Crystal Light Valve. The Optical Excisor used heterodyning principles which in an OSP sense usually involves an interferometer (MZI) and common path interferometer (CPI). OAFFI (MZI) exhibited phase stability problems in the optical output. To overcome these phase stability problems, the common path interferometer version of OAFFI was built. OAFFI (CPI) overcame the phase stability problems of OAFFI (MZI). However, stability problems resulting from positive feedback at various frequencies were observed in OAFFI (CPI). Nevertheless, OAFFI (CPI) also demonstrated some positive results that should stimulate further investigations. GRA

N84-29719# Messina Univ. (Italy).
THE OPTICAL SPECTRA OF AEROSOLS Interim Report, Oct. 1983 - Mar. 1984
F. Borghese Mar. 1984 10 p
(Contract DAJA37-81-C-0895; DA Proj. 1T1-61102-BH-57)
(AD-A141571; IR-6) Avail: NTIS HC A02/MF A01 CSCL 20/6

On the basis of previous theory aimed at calculating the macroscopic optical constants of monodisperse model aerosol, it is now possible to calculate the absorption coefficient of a poly-disperse aerosol, as well as the changes induced on it by changes in the structure of the scattering particles. This report consists of a summary of the mathematical development.
Author (GRA)

N84-29720# IBM Research Lab., San Jose, Calif.
OPTICAL GENERATION AND DETECTION OF ACOUSTIC PULSE PROFILES IN GASES FOR NOVEL ULTRASONIC ABSORPTION SPECTROSCOPY
A. C. Tam and W. P. Leung 22 May 1984 19 p
(Contract N00014-83-C-0170)
(AD-A141876; RJ-4312; TR-9) Avail: NTIS HC A02/MF A01 CSCL 20/6

We demonstrate a new all-optical, frequency-multiplexed and fast technique for gas-phase ultrasonic absorption spectroscopy. A pulsed laser produces a short-duration acoustic pulse in the gas sample, and the acoustic pulse profiles at two distances are monitored by focused continuous probe beams. Fourier decompositions of these probe deflection signals provide the absorption spectrum, and examples for CO2 + H2O mixture are given. Ultrasonic propagation speeds in the MHz regime are also obtained for several gases. GRA

N84-29721# IBM Research Lab., San Jose, Calif.
PHOTOTHERMAL SPECTROSCOPY OF WEAKLY ABSORBING SAMPLES USING A THERMAL WAVE PHASE SHIFTER
H. Coufal 5 Jun. 1984 18 p
(Contract N00014-81-C-0418)
(AD-A142056; TR-6) Avail: NTIS HC A02/MF A01 CSCL 20/6

The concept of a thermal wave phase shifter for photothermal studies of weakly absorbing samples is described. Both sample and reference are excited simultaneously, but their respective photothermal signals reach the detector subsequently. Depending on the phase shift photothermal absorption or transmission spectra can be recorded readily with the same sample. The versatility of this technique is demonstrated by spectroscopic studies of a neodymium oxide doped poly(methyl metacrylate) film. At energy fluences in the order of 10 mj/sq cm sensitivities of 10 to the 14th power molecules/sq cm are achieved with conventional, unstabilized, light sources. The quantum yield for nonradiative decay is determined to be 90% throughout the entire visible spectrum. Author (GRA)

N84-29722# Defense Electronics Supply Center, Dayton, Ohio.
MINUTES OF THE FIBER OPTICS STANDARDIZATION PLANNING MEETING
12 Dec. 1983 183 p Meeting held at Dayton, Ohio, 1-3 Aug. 1983
(AD-A142152) Avail: NTIS HC A09/MF A01 CSCL 20/6

Partial Contents: Report on NATO Allied Publications for Fiber Optics Components, IECSC, International Electro-Technical Commission Subcommittee 46E on Fiber Optics, EIA TR-44, Optical Communications Systems Committee Report, Fiber Optic Technology Center Briefing, Report on Cleaved-Coupled-Cavity (C3), Semiconductor Lasers, EIA P6.7 Fiber Optic Cable Committee Report, and Report on EIA P-6.1 Committee on Fiber Optics. GRA

N84-29723# Department of the Army, Washington, D. C.
MULTIPLE GAP OPTICALLY ACTIVATED SWITCH Patent Application
L. J. Bovino, inventor (to Army) Filed 5 Apr. 1984 10 p
(AD-D011014; US-Patent-Appl-SN-596966) Avail: NTIS HC A02/MF A01 CSCL 20/6

Solid state optically activated switches in which a plurality of spaced contacts are arranged in a line on one of the broad surfaces of a semiconductor wafer and one or more bridging electrodes are arranged on the opposite broad surface thereof. The two end contacts are the switch terminals. This arrangement directs the electric field and the load current into the bulk of the semiconductor in a zig-zag fashion to provide a high hold-off voltage and a short conduction path. Also the bridging electrode can be used as a control electrode. A novel circuit utilizing such switches is shown.
Author (GRA)

N84-29724# Department of the Navy, Washington, D. C.
FIBER OPTIC BUNDLE TOWED ARRAY Patent Application
E. J. Sullivan, F. W. Cuomo, and J. G. Kelly, inventors (to Navy) Filed 13 Sep. 1983 15 p
(AD-D011034; US-Patent-Appl-SN-531794) Avail: NTIS HC A02/MF A01 CSCL 09/5

This document describes a fiber optic bundle towed line array having a central strength member and a plurality of longitudinal optical fibers spaced around the bundle near the array outer circumference. Each fiber has at least one in-line intensity modulated optical fiber hydrophone inserted at different preselected locations therealong. Optical potting material is molded around and embeds the optical fibers and the strength member so as to form a small diameter integral array unit. GRA

N84-29725# Department of the Navy, Washington, D. C.
OPTICAL SENSING DEVICES Patent Application
P. Shajenko, inventor (to Navy) Filed 13 Jun. 1983 17 p
(AD-D011038; US-Patent-Appl-SN-503913) Avail: NTIS HC A02/MF A01 CSCL 17/8

This document describes optical sensing devices comprising dual chamber apparatus which use signal and reference light beams together with interferometric methods for detection of physical quantities of interest. The signal part of the chamber experiences the effects of a particular physical quantity to be measured which produces variations in the optical length of the light beam by movement of a mirror, thereby modulating that beam in proportion thereto. Concurrently, the reference beam, of equal pathlength, is passed through an adjacent chamber, isolated from such effects. The modulated signal beam and unmodulated reference beam are then combined to form a fringe pattern, the zero and first order fringes which are superimposed on apertures of optical fibers, which carry the resultant light beams to a photodetectors for converting the optical signals to proportional electrical signals. GRA

N84-29726# Department of the Navy, Washington, D. C.
SIGNAL PROCESSOR FOR REMOTE OPTICAL INTERFEROMETRIC SENSORS Patent Application
P. G. Cable and E. L. Green, inventors (to Navy) Filed 30 Sep. 1983 32 p
(AD-D011045; US-Patent-Appl-SN-537752) Avail: NTIS HC A03/MF A01 CSCL 17/8

This document describes a signal processor for remote optical interferometric sensors which provides detection of signals by means of optical fibers from the sensors without the need for feedback stabilization of below signal band low frequency fluctuations and drift. Amplitude as well as phase stability is maintained. Although feedback techniques are not necessary, use of feedback for the signal band provides linearity of output and suppression of noise thus permitting stable operation of multiple sensor channels using only a single laser source. Author (GRA)

N84-29727# Department of the Navy, Washington, D. C.
FIBER OPTIC LEVER TOWED ARRAY Patent Application
F. W. Cuomo, inventor (to Navy) Filed 31 Oct. 1983 17 p
(AD-D011047; US-Patent-Appl-SN-547273) Avail: NTIS HC A02/MF A01 CSCL 09/5

Document describes a small diameter towed acoustic line array comprising a plurality of miniature fiber optic lever hydrophones spaced at preselected locations along the array and held in place by fiber holders. The array hydrophones are enclosed within a tubular outer sheath which is filled with an acoustically transparent fluid. The hydrophones respond to either the pressure mode or the pressure gradient mode, each hydrophone further comprising at least one receiving and one transmitting optic fiber of the same diameter, a covering sheath, a clear elastomer and a small reflector. The information received is transmitted to and processed by a beamformer external to the array. Author (GRA)

N84-29728# Stanford Univ., Calif. Lab. of Physics.
MEASUREMENT TECHNIQUES USING ULTRASHORT OPTICAL PULSES Final Report, 9 Feb. 30 Sep. 1983
A. E. Siegman Dec. 1983 15 p refs
(Contract DE-AS08-83DP-40179)
(DE84-009241; DOE/DP-40179/1) Avail: NTIS HC A02/MF A01

A rather straightforward set of picosecond pulse measurements is first carried out on polysilicon photodetectors or photoswitches, such as can be very conveniently fabricated onto silicon integrated circuits using standard IC techniques, to serve as on-chip, optically addressable test or diagnostic points. (Such test points may in fact be fabricated directly into the active portion of the IC, or as test points in the disposable Kerr region between chips, for access during initial fabrication only). The necessary laser system for these measurements is described. A literature review of the current state-of-the-art in such electrooptic devices is described. Some of the results of this study are summarized. DOE

N84-29729# OPTRA, Inc., Everett, Mass.
FIBER OPTIC CURRENT PROBE Final Report, 1 Sep. 1983 - 29 Feb. 1984
G. Wyntjes and R. Fox Feb. 1984 21 p
(Contract DE-AC02-83ER-80027)
(DE84-007964; DOE/ER-80027/1) Avail: NTIS HC A02/MF A01

This report documents the results of Phase 1 research into a new type of Fiber Optic Current probe, suitable for high voltage, high current applications. The probe uses a stabilized two frequency HeNe laser to read the magnitude and sign of magnetic field induced circular birefringence in an optical fiber wound around a conductor. Measurements of both alternating and direct currents were demonstrated with a breadboard system. The system was tested at low voltages with currents of up to 4500 amperes peak and with up to 28 turns of optical fiber around the conductor. The response was found to increase linearly with the number of fiber turns. Experimental determinations of the system's frequency response and dynamic range were not possible due to our inability to generate large, fast current transients. The predicted frequency response is 100 kHz with an ability to read transient amplitudes of 300 times the nominal line current. Several single-mode fibers were used to form transducers, and the optimum fiber for further development was identified. The 2-frequency interrogation technique described worked entirely as predicted, and should be applicable to magnetic field measurements in general (i.e., charged particle beams, Tokamaks, antenna patterns, EMP testing, etc.). DOE

N84-29730# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Vision Group.
VISUAL OBSCURATION BY SMOKE SCREENS: RESULTS OF THE OLDEBROEK 2 TRIALS, MAY 1981 PART 1: THEORY, METHODS AND PHOTOMETRIC ANALYSIS
J. M. Valeton, J. W. A. M. Alferdinck, and J. Boogaard Apr. 1984 51 p refs Sponsored by NATO Defence Research Group AC/243
(Contract A79/KL/151)
(IZF-1984-10; TDCK-79150) Avail: NTIS HC A04/MF A01

The obscuring effects of white phosphorus (WP) and hexachloroethane (HC) smokes were studied in the visual range. The WP and HC smoke clouds look white in most conditions because their luminance factors are high, between 0.6 and 1.0. It is possible to describe contrast reducing capability of a smoke screen by an effectiveness measure, luminance factor/transmission factor. An effectiveness threshold can be calculated from the contrast threshold for military vehicles using a simple model. The contrast threshold for military targets in a wood/heather environment is 0.06 on average. Effectiveness can be expressed in terms of the transmission factor. Author (ESA)

N84-29731# Amsterdam Univ. (Netherlands).
INVESTIGATION OF MULTIPLE SCATTERING CONTRIBUTIONS TO THE DEPOLARIZATION OF LIGHT SCATTERED BY CARBON DIOXIDE AND XENON IN THE CRITICAL REGION. PART 3: COMPARISON BETWEEN THEORY AND EXPERIMENTAL RESULTS
N. J. Trappeniers, R. H. Huijser, A. C. Michels, and H. M. J. Boots 1984 32 p refs Sponsored by Stichting voor Fundamenteel

Onderzoek der Materie (FOM) and Nederlandse Organisate voor Zuiver Wetenschappelijk Onderzoek (ZWO)
(VDW-Publ-287; B8466605) Avail: NTIS HC A03/MF A01

Experimental investigation of multiple scattering of light in the gas-liquid critical region and numerical calculation of the double and triple scattering contribution are compared. Effects masking ideal double and triple scattering behavior in experimental data are discussed. Good agreement between theory and experiment is obtained at small values for the height of the observed volume. Author (ESA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N84-29732# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technol.
ANALYSIS OF THE INFLUENCE OF NONLINEAR AND DISSIPATIVE EFFECTS IN ATMOSPHERIC PLASMA [ANALIZA WPLYWU EFEKTOW NIELINIOWYCH I DYSYPATYWNYCH W PLAZMIE MAGNETOSFERYCZNEJ]
B. Atamaniuk and K. Zuchowski 1982 40 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

The basic concepts associated with the propagation of electromagnetic coupled plasmas were reviewed. Emphasis was on principles of kinetics theory, including the Vlasov equation and the theory of weak turbulence. Theoretical bases were considered for problems connected with the designation of the density of magnetospheric plasma as a function of its interaction with electromagnetic waves. Phenomena which can be described with the MDH model as well as kinetic phenomena were discussed with regard to their nonlinearity and dissipation. The interaction of electromagnetic waves with magnetospheric plasma was described, with particular focus on the hydrodynamics of weakly coupled plasmas. Author

N84-29733# Polish Academy of Sciences, Warsaw. Inst. for Basic Problems of Technol.
EFFECT OF THE DENSITY OF IONIZED PARTICLES ON THE PLASMA RESPONSE IN THE PLASMOSPHERE [WPLYW GESTOSCI CZASTEK ZJONIZOWANYCH NA ODPOWIEDZ PLAZMOWA W PLAZMOSFERZE]
Andrej J. Turski 1983 24 p refs In POLISH
(ISSN-0208-5658) Copyright. Avail: Issuing Activity

The response of nonlinear magnetospheric plasma to a disturbance of the state of equilibrium of the plasma is described mathematically. The plasma is described with the use of the Vlasov-Poisson equations and the hierarchization method, and the solutions are dependent on the equilibrium distribution of plasma components. The Vlasov equations describing the two-component plasma in an external, stable magnetic field are reduced to one-dimensional equations. Then the Vlasov equations are reduced to a finite system of linear hierarchical equations. For the adopted equilibrium distributions, for which solitons may appear as the plasma response, the shape of the potential of a soliton wave of arbitrary amplitude depends on plasma density. This dependence is expressed in a reduction of the soliton impulse during the increase in density and in the preservation of the amplitude dimensions. The shape of the soliton in ionic-sonic plasma is dependent on the temperature of the hot electrons. The amplitude and breadth of the soliton impulse increase proportionally with the increase in the temperature of the electrons. M.G.

N84-29734# Nagoya Univ. (Japan). Inst. of Plasma Physics.
STEADY-STATE SOLUTIONS OF PROPAGATING LIB WITH ROTATING MOTION
Hiroyuki Murakami Apr. 1984 42 p refs
(IPPJ-672) Avail: NTIS HC A03/MF A01

Steady state solutions of rotating and propagating LIB (light ion beams) are correctly obtained by using distribution functions. Charge neutralization and current neutralization factors are considered in the model. The LIB is shown to be hollow by the profiles of solutions based on distribution functions which represent protons as having the same axial velocity and the same or different azimuthal velocities. In practical usage, the LIB is not expected to be hollow. Therefore, a steady state solution is derived incorporating a distribution function wherein protons have different axial and azimuthal velocities. M.G.

N84-29735# Nagoya Univ. (Japan). Inst. of Plasma Physics.
THE dc ACCELERATION OF CHARGED PARTICLES BY AN ELECTROSTATIC WAVE PROPAGATING OBLIQUELY TO A MAGNETIC FIELD VECTOR B SUB O
Ryo Sugihara, Satoshi Takeuchi (Yamanashi Univ.), Kazuo Sakai (Yamanashi Univ.), and Michio Matsumoto (Yamanashi Univ.) Mar. 1984 15 p refs
(IPPJ-671) Avail: NTIS HC A02/MF A01

A charged particle trapped in an electrostatic wave is accelerated in the plane perpendicular to the wave vector k. It is found that there is an optimum angle, theta sub M, at which the particle gains a maximum energy which is about four times larger than that at theta=pi/2, theta being/vector K, vector B sub 0. M.G.

N84-29736# Nagoya Univ. (Japan). Inst. of Plasma Physics.
THE EFFECT OF TRAPPED ELECTRONS ON THE BEAM-INDUCED CURRENT 2
Masayoshi Taguchi Apr. 1984 23 p refs
(IPPJ-673) Avail: NTIS HC A02/MF A01

The toroidal effect on the beam induced current for an axisymmetric toroidal plasma is investigated by means of an expansion in the square root of epsilon (epsilon: inverse aspect ratio). An expression for the induced current is obtained up to the order of epsilon. This current is numerically calculated when the beam ions are monoenergetic and the beam velocity is much smaller than the electron thermal velocity. By use of results, an approximate expression for the induced current is derived as a function of epsilon and effective charge bar-Z of the plasma. M.G.

N84-29737# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
PARTICLE CONFINEMENT DURING LOWER-HYBRID CURRENT DRIVE IN THE VERSATOR 2 TOKAMAK
K. I. Chen, S. C. Luckhardt, M. J. Mayberry, M. Porkolab, and R. Rohatgi Mar. 1984 8 p refs Presented at 4th Intern. Symp. on Heating in Toroidal Plasmas, Rome, 21 Mar. 1984
(Contract DE-AC02-78ET-51013)
(DE84-008941; DOE/ET-51013/114; PFC/CP-84-1; CONF-840311-3) Avail: NTIS HC A02/MF A01

Increases in average density were observed during lower hybrid current drive (LACD) on the Versator II Tokamak and in other LHCD experiments where inductive and lower hybrid current drive are combined. Results of an extensive study of this density increase are presented showing that the increase is the result of an improvement in particle confinement time, tau/sub p/, compared to ohmic discharges with comparable parameters. The improved confinement appears when the Parail-Pogutse relaxation mode is stabilized during LHCD. DOE

N84-29738# California Univ., Livermore. Lawrence Livermore Lab.
LINE INTENSITIES FOR DIAGNOSING LASER-PRODUCED PLASMAS
R. L. Kauffman, D. L. Matthews, R. W. Lee, B. L. Whitten, and J. D. Kilkenny (Imperial Coll. of Sciences and Technology, London, Engl.) 31 Oct. 1983 24 p refs Presented at the 2nd Intern. Conf. and Workshop on Radiative Properties of Hot Dense Matter, Sarasota, Fla., 31 Oct. - 4 Nov. 1983
(Contract W-7405-eng-48)
(DE84-009857; UCRL-89868; CONF-8310178-5) Avail: NTIS HC A02/MF A01

Relative line intensities of the K$_\alpha$ X-ray spectra of Si, Cl, and Ca from laser produced plasmas were measured to assess their

usefulness as a plasma diagnostic. The different elements were added at low concentrations to CH disks which were irradiated at 5 x 10 to the 14th power W/square cm with a 0.53 (MU)m laser pulse of 20 Joules at 1 nsec. The concentration of each element was kept low in order not to change the Z of the plasma, and therefore the plasma dynamics. The various spectra were measured with a time resolved spectrograph to obtain line intensities as a function of time over the length of the laser pulse. These relative intensities of various He-like and H-like lines were compared with calculations from a steady state level population code. The results give good consistency among the various line ratios. Agreement is not as good for analysis of the Li-like satellite lines. Modeling of the Li-like lines need further investigation. DOE

N84-29739# Naval Research Lab., Washington, D. C.
QUASI-STEADY STATE MULTI-PLASMA CLOUD CONFIGURATION IN THE IONOSPHERE Interim Report, Oct. 1983 - Oct. 1984
J. Chen, P. Satyanarayana, and S. L. Ossakow 20 Apr. 1984 39 p
(DNA Proj. S99-QMXB; RR03302)
(AD-A141532; AD-E000565; NRL-MR-5302) Avail: NTIS HC A03/MF A01 CSCL 20/9

The morphology of a finite array of plasma density enhancements (multi plasma clouds) in the ionosphere is studied in order to determine the condition under which the system undergoes a quasi steady state E X B drift. In such a system, the polarization induced self electric field inside all the plasma clouds must be essentially equal and uniform. The method of image dipoles previously developed for multi equatorial spread F bubbles is used to calculate the instantaneous electric field exactly. It is found that, even for small separation distances for which the inter cloud interaction is significant, the electric field inside the clouds can remain essentially uniform for typical ionospheric plasma cloud parameters so that the multiple plasma clouds drift in unison without changing their geometrical shapes. This constitutes a quasi steady state configuration. The implications on the behavior of late time plasma cloud striations are discussed. GRA

N84-29740# Naval Research Lab., Washington, D. C.
RESEARCH IN DENSE PLASMA ATOMIC PHYSICS Interim Report, Sep. - Oct. 1983
J. Davis, M. Blaha, R. Cauble, and U. Gupta 19 Apr. 1984 40 p
(RR01109)
(AD-A141538; AD-E000570; NRL-MR-5311) Avail: NTIS HC A03/MF A01 CSCL 20/9

The Density Functional Method (DFM) is examined for its applicability in describing distributions and ionic configurations in dense plasma. These plasmas, where perturbation theories are non valid, can accurately be described by the hypernetted chain (HNC) potential. Comparison of results between the DFM and HNC model indicate that the DFM is valid even in strongly coupled plasmas. Other simpler models are found not to be valid in this regime. The Density Functional Method is applied to hydrogen like argon ions in a hot, dense argon plasma to find energy level shifts and broadening by the plasma and electron collisions. GRA

N84-29741# Naval Research Lab., Washington, D. C.
ADVANCED CONCEPTS THEORY Annual Report, Jan. - Dec. 1983
18 May 1984 129 p
(T99-QAXL)
(AD-A141568; NRL-MR-5330) Avail: NTIS HC A07/MF A01 CSCL 20/9

Results are presented on a variety of research activities concerned with investigating the radiative properties and X-ray conversion efficiency of dense hot plasmas. In this volume are analyses, discussions and numerical simulations on scaling laws for K-shell line power in Z-pinch plasmas, ionization dynamics and diagnostics, atomic processes, ion beam target interactions, and the radiative behavior of mixtures and their potential application as enhanced radiators. Author (GRA)

N84-29742# Naval Research Lab., Washington, D. C.
A BUMPY TORUS BETATRON Interim Report
D. Chernin, A. Mondelli, and C. Roberson 22 May 1984 10 p (RR0-1109)
(AD-A141840; NRL-MR-5327) Avail: NTIS HC A02/MF A01 CSCL 20/7

The combination of a bumpy torus field and a conventional betatron field leads to an interesting strongly-focused, high-current accelerator configuration. The question of orbital stability of a test particle in such a device is discussed and it is shown that the alternating gradient focusing in this accelerator can easily lead to greater than 20% bandwidth in allowed mismatch between the vertical magnetic field and the average beam particle energy. Author (GRA)

N84-29743# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
PLASMA STUDIES ON ION DIODES Final Report, 15 Dec. 1981 - 15 Dec. 1982
G. Bekefi 5 Apr. 1983 36 p
(Contract N00014-82-K-2036)
(AD-A142183) Avail: NTIS HC A03/MF A01 CSCL 20/9

Cathode plasmas in pulsed high current vacuum diodes have been studied using optical interferometry and spectroscopy. Both aluminum and graphite cathodes were used and the diode current density was varied over a factor of ten. The cathode plasma inventory was seen to increase during the length of the pulse and the plasma density was seen to increase with increasing current density. Spectral line emission from H, CI, CII, and CIII was observed when either cathode was used. It is concluded that cathode was used. It is concluded that cathode plasma expansion is dominated by protons from cathode surface contaminants. Author (GRA)

N84-29744# Naval Research Lab., Washington, D. C.
NRC SURVEY ON PLASMA PHYSICS AND FLUIDS FUSION PLASMA CONFINEMENT AND HEATING. CHAPTER 8: INERTIAL CONFINEMENT FUSION Final Report
B. H. Ripin and W. L. Kruer 18 Jun. 1984 18 p
(AD-A142302; AD-E750179; NRL-MR-5225) Avail: NTIS HC A02/MF A01 CSCL 20/9

A survey of inertial confinement fusion research is presented; current issues are emphasized. The inertial confinement approach to fusion is based on compressing thermonuclear fuel to extremely high density, and heating it to temperatures high enough that the fuel ignites and "burns' before the compressed mass has time to disassemble. Inertial confinement research also has many other applications related to the physics of high energy density. The irradiation of plasmas by intense laser light allows the stud of many nonlinear processes with applications throughout plasma physics. The generation of pressures of tens to hundreds of megabars (1 megabar equals a million atmospheres) allows the investigation of matter under very high pressures. The generation of highly ionized matter and of intense short pulses of X-rays allows the study of atomic physics of importance in the development of X-ray lasers. GRA

N84-29745# Massachusetts Inst. of Tech., Cambridge.
RELATIVISTIC ELECTROMAGNETIC INSTABILITIES NEAR ELECTRON CYCLOTRON FREQUENCY AND HARMONICS
A. K. Ram, G. Francis, and A. Bers Mar. 1984 10 p refs Presented at 4th Intern. Workshop on Electron-Cyclotron Emissions (ECE-ECRH), Frascati, Italy, 29 Mar. 1984
(Contract DE-AC02-78ET-51013)
(DE84-009672; DOE/ET-51013/118; PFC/CP-85-5; CONF-840391-1) Avail: NTIS HC A02/MF A01

Linear evolution in space-time of electromagnetic instabilities generated by relativistic beam-type electron distribution functions that characterize highly anisotropic electron plasmas are presented. The plasma is assumed to be infinite, homogeneous and in a static, uniform magnetic field (antiB0). For waves propagating along antiB0 there are two absolute instabilities - the Whistler and the relativistic instability - both near the electron cyclotron frequency

(omega/sub c/). For waves propagating perpendicular to antiB0 instabilities occur at omega/sub c/ and its harmonics. At low densities the instability at omega/sub c/ is absolute and has the highest growth rate, while those at higher harmonics are convective and have lower growth rates. As the density is increased the instabilities at omga/sub c/ and 2omega/sub c/ are absolute. Further increase in the density leads to the instability atomega/sub c/ becoming convective and that at 2omega/sub c/ remaining absolute. The detailed observation of unstable radiation from such plasmas could lead to an estimate of the hot density component of the plasma. In another context, gyrotron-type devices could conceivable be built for generating electromagnetic energy at harmonics of omega/sub c/. DOE

N84-29746# California Univ., Livermore. Lawrence Livermore Lab.
MICROWAVE MEASUREMENT TEST RESULTS OF CIRCULAR WAVEGUIDE COMPONENTS FOR ELECTRON CYCLOTRON RESONANT HEATING (ECRH) OF THE TANDEM MIRROR EXPERIMENT-UPGRADE (TMX-U)
C. W. Williams, R. R. Rubert, F. E. Coffield, B. Felker, B. W. Stallard, and J. Taska 1 Dec. 1983 7 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983
(Contract W-7405-eng-48)
(DE84-009538; UCRL-89242; CONF-831203-134) Avail: NTIS HC A02/MF A01

Development of high power components for electron cyclotron resonant heating applications requires extensive testing. The high power testing of various circular waveguide components designed for application on the Tandem Mirror Experiment Upgrade (TMX-U) is described. These include a 2.5-in. vacuum valve, polarizing reflectors, directional couplers, mode converters, and flexible waveguides. All of these components were tested to 200 kW power level with 40 ms pulses. Cold tests were used to determine field distribution. the techniques used in these tests are illustrated. The new high power test facility at Lawrence Livermore National Laboratory is described and test procedures are discussed. The following test results are discussed: efficiency at high power of mode converters, comparison of high power vs low power for waveguide components, and full power tests of the waveguide system. The reasons behind selection of these systems for use on TMX-U are discussed. DOE

N84-29747# California Univ., Livermore. Lawrence Livermore Lab.
DISASSEMBLY OF ISOCHORICALLY HEATED LIQUIDS
James A. Blink and William G. Hoover (California Univ., Davis) 1 Mar. 1984 28 p refs Presented at the 3rd Intern. Conf. on Liquid Metal Eng. and Technol. in Energy Production, Oxford, 9-13 Apr. 1984
(Contract W-7405-eng-48)
(DE84-009536; UCRL-88213; CONF-840411-17) Avail: NTIS HC A03/MF A01

Sudden deposition of neutron energy into liquid metals with free surfaces is a common feature of many inertial confinement fusion (ICF) reactors. Since the energy is deposited in a time shorter than the liquid's sound transit time, there is no immediate volume change, and the pressure rises to levels that can cause the liquid metals to break into fragments. The degree of fragmentation determines the surface area available for cooling and condensation of liquid metal that was previously vaporized by the fusion target debris and X-rays. Hence, the fragmentation process could be essential to timely reduction of the chamber pressure to driver beam propagation levels. DOE

N84-29748# Los Alamos Scientific Lab., N. Mex.
ROLE OF MAGNETIC RECONNECTION PHENOMENA IN THE REVERSED-FIELD PINCH
Don A. Baker 1983 35 p refs Presented at the Chapman Conf. on Magnetic Reconnection, Los Alamos, N. Mex., 3-7 Oct. 1983
(Contract W-7405-eng-36)
(DE84-007470; LA-UR-84-714; CONF-8310229-10) Avail: NTIS HC A03/MF A01

The reversed-field pinch (RFP), an axisymmetric toroidal magnetic confinement experiment, has physics rich in the area commonly called field line reconnection or merging. The topics where reconnection plays a vital role are reivewed: (1) RFP formation and the phenomenon of self-reversal, (2) RFP sustainment in which the RFP configuration was shown to be capable of maintaining itself for times much longer than earlier predictions from classical resistive MHD theory, (3) steady state current drive in which dynamo action and associated reconnection processes give rise to the possibility of sustaining the configuration indefinitely by means of low frequency ac modulation of the toroidal and poloidal magnetic fields, and (4) the effects of reconnection on the formation and evolution of the magnetic surfaces which are intimately related to the plasma containment properties. All phases of the RFP operation are intimately related to the reconnection and field regeneration processes similar to those encountered in space and astrophysics. DOE

N84-29749# Interscience, Inc., Schenectady, N.Y.
WORLD SURVEY OF MAGNETIC MIRROR CONFINEMENT RESEARCH FACILITIES
James T. Wood, comp. and Robert E. Price (DOE, Washington, D.C.) Feb. 1984 160 p refs Sponsored by DOE
(DE84-009715; DOE/ER-0190) Avail: NTIS HC A08/MF A01

A common format to present the information on each project was adopted. Projects were selected for inclusion based on knowledge of their direct relevance or contribution to the magnetic mirror confinement program. The information on each project was first compiled in draft form from published literature and reports available. The draft material was then sent to key individuals associated with each project, with the original source of information identified, to solicit their additions and corrections. The responses were then reviewed and discrepancies with previously published information clarified through further consultations. The information was then incorporated into the document with a revision date to reflect the state of currency of the information. DOE

N84-29750# G K Systems, Inc., Westlake Village, Calif.
ADVANCED ICRF LAUNCHERS FOR HEATING AND CURRENT DRIVE IN LARGE TOKAMAKS
S. C. Chiu, F. P. Blau, V. S. Chan, C. P. Moeller, P. B. Parks, J. M. Rawls, and F. W. Perkins Jan. 1984 22 p refs Presented at IAEA Tech. Comm. Meeting, Princeton, N. J.
(Contract DE-AT03-84ER-53158)
(DE84-009092; GA-A17325) Avail: NTIS HC A02/MF A01

Two new types of ICRF launcher concepts were analyzed for Tokamak reactor applications. The first type, termed the resonant coil cavity, offers the advantages of (1) convenient and flexible sizing, (2) ease of operation and maintenance, and (3) high power handling capability. Mode structures, resonance conditions, power handling capabilities, and sensitivity to changes in plasma conditions were studied and results indicate this to be a promising launching structure in both present day devices and Tokamak reactors. The second type is the Yagi-Uda type of slow wave structure which has the advantages of (1) protection from the plasma, and (2) well defined and adjustable traveling wave k/sub parallel/spectrum for possible current drive studies. Variations of the k/sub parallel/spectrum and loading with array dimensions and plasma parameters were calculated. Results indicate that this structure is not feasible for present generation Tokamaks because of radial accessibility. There is, however, a window of applicable parameters for reactor type Tokamaks. DOE

N84-29751# Applied Microwave Plasma Concepts, Encinitas, Calif.
PLASMA CONFINEMENT IN SELF-CONSISTENT, ONE-DIMENSIONAL TRANSPORT EQUILIBRIA IN THE COLLISIONLESS-ION REGIME OF EBT OPERATION
C. S. Chang and R. L. Miller 25 Jul. 1983 15 p refs
(Contract DE-AC03-82ER-51030)
(DE84-001861; AMPC-14-006) Avail: NTIS HC A02/MF A01

It has long been recognized that if an EBT confined plasma could be maintained in the collisionless ion regime, characterized

by positive ambipolar potential and positive radial electric field, the particle loss rates could be reduced by a large factor. The extent to which the loss rate of energy could be reduced is investigated using a one dimensional, time dependent transport code. The energy confinement can be improved by roughly an order of magnitude by maintaining a positive radial electric field that increases montonically with radius, giving a large ExB drift near the outer edge of the core plasma. The radial profiles of heat deposition required to sustain these equilibria are presented, and scenarios for obtaining dynamical access to the equilibria are discussed. DOE

N84-29752# California Univ., Livermore. Lawrence Livermore Lab.
RECENT RESULTS OF STUDIES OF ACCELERATION OF COMPACT TOROIDS
James H. Hammer, C. W. Hartmen, and J. Eddleman (Levy (S.), Inc.) 2 Mar. 1984 5 p refs Presented at the 6th US-Japan Symp. on Compact Toroid Res., Princeton, N.J., 20-23 Feb, 1984 (Contract W-7405-eng-48)
(DE84-008330; UCRL-90515; CONF-840255-10) Avail: NTIS HC A02/MF A01

The observed gross stability and self-contained structure of compact toroids (CT's) give rise to the possibility, unique among magnetically confined plasmas, of translating CT's from their point of origin over distances many times their own length. This feature has led us to consider magnetic acceleration of CT's to directed kinetic energies much greater than their stored magnetic and thermal energies. A CT accelerator falls in the very broad gap between traditional particle accelerators at one extreme, which are limited in the number of particles per bunch by electrostatic repulsive forces, and mass accelerators such as rail guns at the other extreme, which accelerate many particles but are forced by the stress limitations of solids to far smaller accelerations. A typical CT has about a Coulomb of particles, weighs 10 micrograms and can be accelerated by magnetic forces of several tons, leading to an acceleration on the order of 10(11) gravities. DOE

N84-29753# Science Applications, Inc., La Jolla, Calif. Applied Plasma Physics and Technology Div.
DDRFP TRANSPORT CODE
R. N. Byrne, D. Dobrott, and S. Tamor Sep. 1983 8 p refs (Contract DE-AC03-81ER-53113)
(De84-008573; DOE/ER-53113/T2) Avail: NTIS HC A04/MF A01

DDRFP is a 1-1/2 dimensional plasma transport code, based on the G2M Tokamak code but extended to handle RFPs. The code treats a plasma of ions and electrons whose density and temperature vary across flux surfaces and with time, coupled to a magnetic field. As in G2M, plasma and field are assumed to evolve through a succession of states of pressure balance, and almost constantly on flux surfaces. The independent variables are the volume V (per radian) of a flux surface and the time t. Cgs units are used throughout. The primary dependent variables of the code are the electron density n(V,t), the electron pressure P/sub e/(V,t), the ion pressure P/sub i/(V,t), the poloidal flux psi (V,t), and the poloidal current (times 4(PI)/c)f(V,t). Five partial differential equations are needed to advance these five functions. In addition, there are models for subsidiary quantities such as fluxes, ionization states, and neutral densities. These are given in terms of the primary dependent variables. DOE

N84-29754# Wisconsin Univ., Madison. Dept. of Physics.
EXPERIMENTAL STUDY OF IMPURITY PRODUCTION IN THE TOKAPOLE II TOKAMAK Ph.D. Thesis
Nancy Susan Brickhouse 1984 103 p refs (Contract DE-AC02-76ET-53051)
(DE84-009659; DOE/ET-53051/62) Avail: NTIS HC A06/MF A01

The relase mechanism for low Z impurities in Tokapole II is characterized through impurity doping and isotopic exchange experiments. The desorption mechanism responsible for the low-Z impurity concentrations during the rise phase of the plasma current depends on the mass of the plasma ions. Doping with small amounts of any gas studied (H2, D2, He, N2, O2, Ne, Ar, Kr, and Xe) increases the early time radiation of O, C, and N. For exotic gas doping this increase is linear with the dopant concentration, and proportional to the mass of the dopant, as expected for a momentum transfer process. Isotopic exchange experiments confirm the mass dependence of oxygen production. A time dependent coronal model is compared with the vacuum ultraviolet spectroscopic signals of the ionizing oxygen. The quantity sigma/tau (desorption cross section divided by particle confinement time) is determined to be 4 x 10(13)cm (2)/msec. The oxygen influx has a large peak early in the start up. DOE

N84-29755# Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
[ACTIVITIES REPORT IN PLASMA PHYSICS] Annual Status Report, 31 Dec. 1983
Apr. 1983 109 p refs Sponsored by EURATOM and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)
Avail: NTIS HC A06/MF A01

Experimental investigations of plasma pinches; turbulent heating in the TORTUR Tokamak; plasma diagnostics; cold plasma blankets; and electron cyclotron resonance heating are described. Theoretical investigations of magnetohydrodynamics; wave dynamics; and transport problems are summarized. Author (ESA)

N84-29756# Paris-Sud Univ., Orsay (France). Lab. de Physique des Gaz et des Plasmas.
THE ROLE OF METASTABLES IN REACTIVE PLASMAS
A. Ricard May 1984 28 p refs Presented at 5th Symp. on Elementary Processes and Chem. Reactions in Low Temperature Plasmas, Bratislava, Czechoslovakia, 1984
(LP-206) Avail: NTIS HC A03/MF A01

The production of metastables in glow discharges of reactive gas mixtures at low pressure and low gas temperature is reviewed. Mixtures of rare gases and molecules are analyzed by considering electron excitation and destruction processes, losses by diffusion and excitation transfers. Examples of cold plasma chemistry concerning gas impurity analysis and the uppsr atmosphere are given. Author (ESA)

N84-28847# Joint Publications Research Service, Arlington, Va.
FURTHER ANALYSIS OF PLASMA BURSTS IN HIGH-LATITUDE BOUNDARY LAYER OF EARTH Abstract Only
A. N. Omelchenko, O. L. Vaysberg, and K. T. Rassell *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 68-69 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 885-891 Original language document announced as A84-19733 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28848# Joint Publications Research Service, Arlington, Va.
ION KINETICS, MINOR NEUTRAL AND EXCITED COMPONENTS IN D-REGION WITH HIGH LEVEL OF IONIZATION Abstract Only
V. A. Vlaskov, N. V. Smironova, and S. I. Kozlov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 69 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 892-896 Original language document announced as A84-19734 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N84-29757# Defence Research Information Centre, Orpington (England).
METAL-SEMICONDUCTOR PHASE TRANSITION AND ITS APPLICATION

A. A. Bugayev, B. P. Zakharchenya, and F. A. Chudnovsky Feb. 1984 307 p refs Transl. into ENGLISH of Russian book, Leningrad, Nauka, 1979
(BLL-DRIC-Trans-7149-(3623.66); BR91266) Avail: British Library Lending Div., Boston Spa, Engl.

Results of the theoretical and experimental analysis of metal-semiconductor phase transition are presented. Basic physical models which explain the phase transition phenomenon are investigated, and properties of vanadium dioxide and sesquioxide are reviewed together with the homologous series of vanadium oxides using the Magneli series (1948) as an example. Finally, phenomenological aspects of phase transition are considered, and experimental and theoretical data are presented on the application of vanadium oxide films in holography. Author

N84-29758*# National Aeronautics and Space Administration, Washington, D. C.
BOUNDARY MIGRATION AND DISAPPEARANCE OF VOIDS IN ALPHA-Al2O3 AT 2000 DEG C
M. Komatsu and H. Fujita May 1984 6 p refs Transl. into ENGLISH from Seramikkusu (Japan), v. 17, no. 8, 1982 p 634-636 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Osaka Univ., Japan
(Contract NASw-3541)
(NASA-TM-77436; NAS 1.15:77436) Avail: NTIS HC A02/MF A01 CSCL 20L

A series of photographs taken with Osaka University's high temperature 3MV electron microscope of alpha-Al(2)O(3) at 2000 C is presented. The dynamic study shows grain boundary migration in progress and demonstrates that disappearance of voids is controlled by boundary migration. Author

N84-29759# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
HIGH RESOLUTION CATHODOLUMINESCENCE OF YELLOW AND WATERCLEAR CVD POLYCRYSTALLINE ZnS M.S. Thesis
D. Blessinger Dec. 1983 132 p
(AD-A141100; AFIT/GEP/ENP/83D-2) Avail: NTIS HC A07/MF A01 CSCL 20/2

This investigation used high resolution cathodoluminescence to determine the spectral emissions and optical properties of the yellow and waterclear forms of undoped cubic chemical-vapor-deposited polycrystals of ZnS. The spectra between 3200 and 9000 A was investigated at 10 K. The yellow material was determined to have characteristically poor quality with little band edge structure. The special annealing procedure used to make waterclear ZnS from the yellow ZnS was found to greatly improve the quality of the crystals. Waterclear ZnS was of a quality equivalent to the best single crystals despite the polycrystalline form. It had a complex near band edge structure. Oxygen was found to have migrated to the crystal boundaries. The spectra of the waterclear ZnS at 10 K agreed with the literature. GRA

N84-29760# Westinghouse Research and Development Center, Pittsburgh, Pa.
SUPERCONDUCTING ELECTRONIC FILM STRUCTURES Annual Report, 1 Jan. - 31 Dec. 1983
A. I. Braginski and J. R. Gavaler 11 Jan. 1984 19 p
(Contract F49620-83-C-0035; AF Proj. 2306)
(AD-A141113; Rept-84-9C9-SUPER-R1; AFOSR-84-0332TR) Avail: NTIS HC A02/MF A01 CSCL 20/3

Single crystal NbN films were prepared on sapphire having a (2,-1,-1,3) surface orientation. Electron diffraction and Laue data show that the NbN and sapphire orientations are related, proving epitaxial growth. A15 structure V-Si and for the first time A15 Nb-Ge films were prepared reproducibly by a reactive sputtering process. These compounds were formed at temperatures as low as 500 C with critical temperatures above 12K. Niobium films were prepared at less than 100 C with critical temperatures greater than 9K. Epitaxial quality A15 Nb-Ir single crystal substrates were prepared. A new magnetron sputtering system was implemented. Progress on the assembly and implementation of a MBE-type deposition and in situ analytical facility is reported. Author (GRA)

N84-29761# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
MOLECULAR BEAM EPITAXY OF HgCdTe Final Report, 1980 - 1983
C. J. Summers, E. L. Meeks, and N. W. Cox 30 Mar. 1984 39 p
(Contract DAAG29-80-K-0012)
(AD-A141574; ARO-17036.3-EL) Avail: NTIS HC A03/MF A01 CSCL 20/2

The design of a molecular beam epitaxial growth system for HgCdTe alloys is described and has been used to grow CdTe and HgCdTe layers. Investigations of the properties of these layers by reflection electron diffraction, u.v. reflectivity and X-ray diffraction measurements show that at present the quality of CdTe substrates and/or surface preparation procedures cause an initial degradation of the quality of the layer, but that these defects can be grown out. For CdTe layers thicker than 5 microns, good quality surfaces are obtained. Epitaxial deposited CdTe has been shown to be remarkably adaptable and (111) orientated CdTe layers have been grown on (100) orientated GaAs and InP substrates. Mercury cadmium telluride layers with x-values between 0.9 and 0.17 were grown on these CdTe buffer layers and demonstrated good crystal quality with spectral response characteristics extending out to 10 microns at 300K. Author (GRA)

N84-29762# University of Southern California, Los Angeles. Electronic Sciences Lab.
HIGH RESOLUTION MEASUREMENTS OF IMPURITY-INDUCED LOCALIZED VIBRATIONAL MODES IN SEMICONDUCTORS Final Scientific Report, 1 Mar. 1983 - 29 Feb. 1984
W. G. Spitzer 26 Mar. 1984 39 p
(Contract F33615-81-C-1406; Grant AF-AFOSR-0092-83; AF Proj. 2306)
(AD-A141577; AFOSR-84-0446TR) Avail: NTIS HC A03/MF A01 CSCL 20/12

The recent measurements and study of the carbon-induced localized vibrational mode (LVM) in GaAs have demonstrated that nearest neighbor isotropic frequency shifts can be observed if one uses the high resolution capability of a Fourier transform infrared (FITR) spectrometer. One major importance of such measurements lies in the use of the shifts to determine the impurity site and the formation of complexes such as dimers. This feature has been used in a detailed study of the LVM infrared absorption of Si-doped GaAs. Samples electrically compensated by electron irradiation and by Li saturation were used in the study. Bands due to SiGa, SiAs, SiGa-SiAs, 7LiGa, and SiAs-AsGa (or VGa) were studied in high resolution. In several cases the structures observed in the high resolution measurements were compared with model calculations with generally satisfactory results. GRA

N84-29763# Rockwell International Science Center, Thousand Oaks, Calif.
SINGLE CRYSTAL GROWTH OF FERROELECTRIC TUNGSTEN BRONZE COMPOSITIONS FOR SAW APPLICATIONS Final Report, 26 Jul. 1982 - 31 Dec. 1983
R. Neurgaonkar Feb. 1984 36 p
(Contract F49620-82-C-0078; AF Proj. 2306)
(AD-A141741; SC5346.1FR; AFOSR-84-0435TR) Avail: NTIS HC A03/MF A01 CSCL 20/2

Ferroelectric tungsten bronze single crystals were grown by the Czochralski technique. The crystals belong to the tetragonal point group 4mm with spontaneous polarization parallel to the "c' axis. Room temperature dielectric and piezoelectric measurements indicated that the k 15 and d 15 coefficients are significantly larger for these bigger unit cell bronzes as compared to the smaller unit cell bronzes, e.g., SBN, SKN, etc. The results of this study indicated that since the piezoelectric properties of these crystals are better than SBN, it is expected that these composition crystals should show better acoustical properties. As reported earlier, SBN crystals are known to possess excellent acoustical properties and are useful for device application. Hence, this opens up further

new interest in this family of crystals for potential use in SAW device applications. Author (GRA)

N84-29764# Tennessee Univ., Knoxville.
FABRICATION OF BIAXIALLY ORIENTED FILMS VIA POLY(P-PHENYLENE TERAPHTHALAMIDE)/H2SO4 LIQUID CRYSTALLINE DOPES Final Report
J. F. Fellers and J. L. White 31 May 1984 12 p
(Contract N00014-77-C-0236)
(AD-A141755) Avail: NTIS HC A02/MF A01 CSCL 20/2

The fundamental innovation arising from this research is that the state of spatial biaxial order in lyotropic Poly(p-phenylene terephthalamide)(PPTA/H2SO4) liquid crystal solutions is strongly controlled by an externally imposed stress field. Also the orientation only relaxes slowly after the stresses are released. This enables processes to be devised that develop biaxial stress on a flowing liquid crystal to cause high levels of molecular orientation. Since the character of the stress, i.e., the magnitude and direction of the sigma ij components, is set by the experimental conditions, then the orientation is also controllable. Thus a process has been developed which takes advantage of the rheological and phase behavior of PPTA/H2SO4 to create films ranging from uniaxial through unequal biaxial to equal biaxial orientation. This and other structural features have been documented by WAXS, pole figure analysis, microscopy and SAXS. Also mechanical property studies show that a range of strengths and moduli can be obtained including a film of equal axial orientation (fzc = 0.45, fyc = 0.50 using the White-Spruiell indices from 0.0 to 0.5 where 0.5 means perfect orientation). Property values for this film are modulus in the machine direction = 700,000 psi and transverse direction = 800,000 psi with tensile strengths in the machine direction = 25,000 psi and transverse direction = 30,000 psi. GRA

N84-29765# EIC, Inc., Norwood, Mass.
SCHOTTKY BARRIER PHOTOELECTRODES WITH A VARIABLE BARRIER HEIGHT Final Report, 26 Sep. 1983 - 25 Mar. 1984
R. D. Rauh and D. R. Rogers May 1984 31 p
(Contract N00014-83-C-0763)
(AD-A141813; C-757) Avail: NTIS HC A03/MF A01 CSCL 20/12

The purpose of this research is to investigate the properties of Schottky barriers formed between semiconductors and ion insertion compounds having continuously and reversibly variable work functions. In Phase 1, the diode p-Si/M(x)WO3 (M = H, Li) was studied. Li(x)WO3 thin films, prepared by vacuum evaporation or sputtering, showed work functions spanning the range 4.2-5.2 eV for x = 0 to 0.4. Electrical measurements on solid state diodes employing Li(x)WO3 layers revealed a barrier height modulation of 0.06V for this range, limited by significant Fermi level pinning. Photoelectrochemical measurements of H(x)WO3 coated p-Si electrodes showed that the ion insertion compound enhanced electrode stability and photoresponse in acidic electrolytes. The band bending in naked and coated p-Si electrodes was measured as a function of applied bias using a new technique assessing saturation photovoltage as the electrode is polarized. The slope of these curves, (dVB/dV), is related inversely to the interface state density, Ds. Ds was significantly reduced by the H(x)WO3 overlayer. Author (GRA)

N84-29766# Clemson Univ., S.C. Dept. of Electrical and Computer Engineering.
BALLISTIC TRANSPORT IN SUBMICRON SILICON MOSFETS Final Report, 1 May 1981 - 31 Dec. 1983
D. J. Dumin 28 Mar. 1984 81 p
(Contract N00014-81-K-0347)
(AD-A142036) Avail: NTIS HC A05/MF A01 CSCL 09/1

Recent improvements in the manufacturing of MOSFETs have reduced the minimum feature size and brought transistors with submicron geometries into being. For certain materials such as GaAs, gate lengths on the order of 0.2 micron are not comparable in length to the mean free path of the electrons in the channel at room temperature. It has been suggested that these electrons could cross the channel without suffering a collision, a phenomenon referred to as ballistic transport. For silicon devices the ballistic transport phenomenon might occur at cryogenic temperatures (4.2K) where decreased scattering results in high low-field mobilities. We characterized submicron silicon MOSFET's down to 4.2K in the subthreshold, linear and saturation regimes. A 500um MOSFET was used as a comparison device. The measurements indicated that the effective channel mobility was inversely proportional to the ambient temperature, longitudinal field and transverse field. GRA

N84-29767# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
RESEARCH ON THE CRYSTAL GROWTH AND DIELECTRIC PROPERTIES OF HIGH PERMITTIVITY FERROELECTRIC MATERIALS Annual Report, 1 Mar. 1983 - 29 Feb. 1984
R. Neurgaonkar and J. R. Oliver May 1984 87 p
(Contract N00014-81-C-0463)
(AD-A142125; SC5345.4AR) Avail: NTIS HC A05/MF A01 CSCL 20/2

Millimeter wave measurements on two tungsten bronze SBN and BSKNN have shown a strong temperature dependence for the permittivity and dielectric losses, with both decreasing at low temperatures down to 77K for the electric field parallel to the polar axis. The observed changes in epsilon' and epsilon' perpendicular to the polar axis are much less, being only 30-40%. A temperature sensitive peak in the polar epsilon' has been observed for some samples. SBN crystals doped with Ce and Fe and have been successfully grown under DARPA contract, and work is continuing on improvements in the overall crystal quality of this bronze. Work is also continuing on the growth of ceramic and single crystal BSKNN, and ceramic KLN for evaluation of the millimeter wave properties of large unit cell "stuffed' bronzes. Grain oriented, hot-pressed PBN is also being developed in order to examine the properties of morphotropic phase boundary bronze compositions. GRA

N84-29768# Litton Systems, Inc., Morris Plains, N. J.
PREPARATION OF MIXED PEROVSKITE OXIDES FOR BLUE-GREEN LASERS Annual Report, Oct. 1982 - Jan. 1984
R. F. Belt and R. Uhrin Feb. 1984 51 p
(Contract N00014-83-C-0072)
(AD-A142195) Avail: NTIS HC A04/MF A01 CSCL 20/2

Mixed crystals of the perovskite type structure of the system La A1 1-x Sc x, 03 were examined over the compositions of x= 0.15-0.30. Single crystals were grown from melts in iridium crucibles using the Czochralski method. Seed crystals of (111) pure La A1 Q3, were used. The growth atmosphere was controlled at 99.75% N2 and 0.25% H2. Dopants of Ce3+ were maintained at 0.01-0.05 atomic per cent. Preliminary work on polycrystalline materials showed that blue-green luminescence at 485 nm was found. The grown crystals had various amounts of Sc incorporated and were usually translucent. At the x= .30 formulation of melt, about 60 - 75% of Sc is believed to enter the crystal. No direct evidence was found for ordered type structures. The phase data, compositions, crystal quality, luminescence data, and X-ray results are discussed. Author (GRA)

N84-29769# Department of the Air Force, Washington, D.C.
RADIATION UPSET THRESHOLD DETECTOR APPARATUS Patent Application
E. J. Vitek, inventor (to Air Force) Filed 9 Nov. 1983 9 p
(AD-D011030; US-Patent-Appl-SN-550286) Avail: NTIS HC A02/MF A01 CSCL 20/12

When an electronic device utilizing semiconductors is operated in an environment which is subjected to radiation such as gamma rays, hole electron pairs are generated within the semiconductor material. These carriers move by diffusion and drift to and through the semiconductor junctions. The effect of these carriers passing through the semiconductor junction is to produce transient photocurrents. The current components which enter the base region are called the primary photocurrents. The major component of primary photocurrent is produced in the collector region and in the transition region of the collector-base junction. The emitter

component of the primary photocurrent is, in general, substantially smaller than the major component of the primary photocurrent. The short diffusion length which is utilized in the emitter contributes to the smaller emitter component of the primary photocurrent. The present invention utilizes an adder and subtractor circuit to convert the output signal from an electronic circuit that is operating in a radiation environment, to a pair of sum and difference voltages. These voltages are applied to a comparator unit to provide an indication when the radiation upset threshold level has been exceeded for the unit under test. GRA

N84-29770# Department of the Air Force, Washington, D.C.
QUARTZ GROWTH ON X-SEEDS Patent Application
A. F. Armington, inventor (to Air Force) Filed 28 Dec. 1983 15 p
(AD-D011031; US-Patent-Appl-SN-566130) Avail: NTIS HC A02/MF A01 CSCL 20/2

This invention concerns itself with a method for producing single crystal, seed material for use in growing synthetic quartz crystals. This seed material comprises a Z-faced seed crystal cut or sliced from the X-plus growing region of a synthetic quartz, single crystal boule. GRA

N84-29771# Delaware Univ., Newark. Dept. of Chemical Engineering.
INVESTIGATION OF THE CRYSTALLIZATION KINETICS OF AN INCONGRUENT MELTING SALT HYDRATE UNDER METASTABLE CONDITIONS Final Report
D. L. Klug and R. L. Pigford 6 Jan. 1984 4 p refs
(Contract DE-FG02-79ET-00088)
(DE84-008666; DOE/ET-00088/T1) Avail: NTIS HC A02/MF A01

The rates of growth of both the hydrated and the anhydrous forms of sodium sulfate in aqueous solution were measured. In a first set of experiments, single crystals were used. It was found that the growth of the hydrated crystals was controlled by mass transfer; the anhydrous crystals grow at rates controlled by the rates of incorporation of ions into the crystal lattice. The final experiments were done in a stirred batch crystallizer in which both growth and secondary nucleation of new crystals occurred in a slurry of many crystals. The results show that the growth rates were proportional to the square root of particle size and were approximately in agreement with the data for single crystals. Without seed crystals the rate of generation of new crystals was governed by heterogeneous or secondary nucleation. DOE

N84-29772# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
APPLICATION OF THE GRAPHICAL UNITARY GROUP APPROACH TO THE ENERGY SECOND DERIVATIVE FOR CI WAVE FUNCTIONS VIA THE COUPLED PERTURBED CI EQUATIONS Ph.D. Thesis
Douglas John Fox Oct. 1983 92 p refs
(Contract DE-AC03-76SF-00098)
(DE84-008489; LBL-17305) Avail: NTIS HC A05/MF A01

Analytic derivatives of the potential energy for self-Consistent-Field (SCF) wave functions have been developed in recent years and found to be useful tools. The first derivative for configuration interaction (CI) wave functions is also available. This work details the extension of analytic methods to energy second derivatives for CI wave functions. The principal extension required for second derivatives is evaluation of the first order change in the CI wave function with respect to a nuclear perturbation. The shape driven graphical unitary group approach (SDGUGA) direct CI program was adapted to evaluate this term via the coupled-perturbed CI equations. Several iterative schemes are compared for use in solving these equations. The pilot program makes no use of molecular symmetry but the timing results show that utilization of molecular symmetry is desirable. The principles for defining and solving a set of symmetry adapted equations are discussed. Evaluation of the second derivative also requires the solution of the second order coupled-perturbed Hartree-Fock equations to obtain the correction to the molecular orbitals due to the nuclear perturbation. DOE

N84-29773# Illinois Univ., Urbana. Dept. of Computer Science.
QUASI-NEWTON AND MULTIGRID METHODS FOR SEMICONDUCTOR DEVICE SIMULATION Ph.D. Thesis
Sumantri Slamet Dec. 1983 81 p refs
(Contract DE-AC02-76ER-02383)
(DE84-008487; UIUCDCS-R-83-1154; UILU-ENG-83-1734; COO-2383-0102) Avail: NTIS HC A05/MF A01

A finite difference approximation to the semiconductor device equations using the Bernoulli function approximation to the exponential function is described, and the robustness of this approximation is demonstrated. Sheikh's convergence analysis of Gummel's method and quasi-Newton methods is extended to a nonuniform mesh and the Bernoulli function discretization. It is proved that Gummel's method and the quasi-Newton methods for the scaled carrier densities and carrier densities converge locally for sufficiently smooth problems. DOE

N84-29774# Argonne National Lab., Ill. Materials Science and Technology Div.
RATIONALIZING THE HYDROGEN SITES IN Pd3P SUB 1-xH SUB y
D. G. Westlake Feb. 1984 14 p refs Presented at the Intern. Symp. on the Properties and Appl. of Metal Hydrides, Eilat, Israel, 9-13 Apr. 1984
(Contract W-31-109-eng-38)
(DE84-009159; CONF-8404106-2) Avail: NTIS HC A02/MF A01

A recently developed geometric model was used to rationalize the observed site occupation by hydrogen atoms in hydrogenated Pd3P/sub 1-x/. While several types of interstices appear to be large enough to accommodate hydrogen atoms, only one type that is associated with a vacant phosphorous site is actually occupied. A repulsive interaction between hydrogen and phosphorous atoms was invoked to explain this behavior. Consideration of probabilities was that the applicability of a blocking model without any overlap of H-H interactions should be attributed to the wide separation or P sites is inherent in the structure of Pd3P. DOE

N84-29775# California Univ., Berkeley. Lawrence Berkeley Lab.
EXPERIMENTAL INVESTIGATION OF 4-DIMENSIONAL SUPERSPACE CRYSTALS
T. Rasing and A. Janner Sep. 1983 6 p refs Presented at 5th European Meeting on Ferrolectricity, Malaga Spain, 1 Sep. 1983
(Contract DE-AC03-76SF-00098)
(DE84-009239; LBL-17206; CONF-8309225-1) Avail: NTIS HC A02/MF A01

The symmetry of incommensurate crystals is described by higher dimensional space groups in the so called superspace approach. The basic ideas are explained and used for showing that superspace groups provide an adequate frame for analyzing experimental results on incommensurate crystals. DOE

N84-29776# Sandia Labs., Albuquerque, N. Mex.
PREPARATION OF DEVICE QUALITY STRAINED-LAYER SUPERLATTICES
R. M. Biefeld 1984 25 p refs Presented at the Ind. and Eng. Chem. Div. Meeting of the ACS, Davis, Calif., 26 Mar. 1984
(Contract DE-AC04-76DP-00789)
(DE84-009488; SAND-83-2170C; CONF-840398-1) Avail: NTIS HC A02/MF A01

A strained layer superlattice (SLS) consists of very thin (less than or equal to 500 A) alternating layers of lattice mismatched semiconductors. When the layers are thin enough the mismatch between the materials is totally accommodated by strains within the layers and no misfit defects are generated. Thus device quality material is prepared from a variety of mismatched semiconductors by using SLSs. Also, it was shown that the SLS band gap is varied independently of the lattice constant over a continuous range of lattice constants by the proper choice of composition and layer thickness. Utilizing the unique structural, optical, and

electrical properties of SLSs, high quality heterostructures is prepared for use in a variety or device applications. The quality of SLSs characterized by current voltage, electroluminescence and mobility measurements. These materials were shown to be of suitable quality for field effect transistors and lasers were prepared from SLSs. The characterization of some of these devices is discussed. DOE

N84-29777# Karlsruhe Univ. (West Germany).
DEVELOPMENT OF INTEGRATED DIGITAL CIRCUITS WITH JOSEPHSON JUNCTIONS Final Report, Dec. 1982
Wilhelm Jutzi Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 117 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-044; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 24,50

Josephson junctions for memory and logic application were surveyed to allow an implementation within given fabrication tolerances. Computer simulation of asymmetric interferometers as memory cells for nondestructive read out and as AND and OR gates were worked out and uniform interferometers with Josephson junctions as shift registers were developed. Simulation results are successful for hardware prototypes comprising 1 niobium and 3 lead alloy metallizations at a minimum line of 8 microns. Author (ESA)

N84-29778# Valvo G.m.b.H., Hamburg (West Germany).
ALL SOLID STATE CCD IMAGE SENSOR Final Report, Feb. 1983
Manfred Herrmann, Rolf Jacobson, Ingo Laasch, Bernd Lullies, and Juergen Mueller Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 100 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-046; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21

Two solid state CCD image sensor concepts are presented. Resistive gate sensors (RGS) containing 300 x 200 picture elements with 42 sqmm chip area were fabricated and successfully tested in a specially designed driving circuit and signal processing RGS camera. An economical fabrication of the RGS image sensor is possible. Test results demonstrate the suitability of these sensors for surveillance. A big area sensor with a high number of picture elements (600 x 800, frame transfer) was designed. Results show that frame transfer sensors with three parallel arranged output registers can be made. Author (ESA)

N84-29779# Max-Planck-Institut fuer Festkoerperforschung, Stuttgart (West Germany).
ANALYSIS OF IMPURITIES FORMING RECOMBINATION CENTERS IN SILICON Final Report, Dec. 1982
Klaus Wuenstel, Karl-Heinz Froehner, and Peter Wagner Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 64 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-049; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13,50

Electrical properties and formation of impurities in iron doped silicon are studied. Defects were introduced by diffusion. Deep level transient spectroscopy and photocapacitance were employed for material characterization. A distinct getter effect of oxygen precipitations on Fe centers is obtained. The formation of Fe complexes is strongly reduced by use of appropriate preparation conditions. Intentional formation of complexes with shallow acceptors (defect tailoring) gives rise to energy level changes of Fe centers. The observed chemical trends in the energy shifts agree with the theoretical model. Author (ESA)

N84-29780# Fraunhofer-Inst. fuer Festkoerpertechnologie, Munich (West Germany).
INVESTIGATIONS TO IMPROVE THE STABILITY OF THERMAL OXIDES ON POLYCRYSTALLINE AND SINGLE CRYSTALLINE SILICON Final Report, Mar. 1983
Helmut Bernt and Hans Bartholomae Bonn Bundesministerium fuer Forschung und Technologie Apr. 1984 82 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-052; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17

Stability of oxides on polycrystalline and single crystalline silicon was studied using constant current stress. The mechanism of time-dependent currents, high field stability of radiation damaged oxides, and their dependence on the polarity of the applied voltage were investigated. The critical factors for the stability of oxides both on single crystalline and on polycrystalline silicon are the trap concentration and the lateral homogeneity of the field strength in the oxide. Time to breakdown is increased by a factor of 10 by improving the process. Author (ESA)

N84-29781# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Electronique et Physique.
CONTRIBUTION TO THE LOW TEMPERATURE STUDY OF MOS TRANSISTORS (10K-77K) Thesis [CONTRIBUTION A L'ETUDE DU TRANSISTOR MOS A BASSE TEMPERATURE (10K-77K)]
Vincent Mosser Dec. 1983 175 p refs In FRENCH
(ENST-83E017; ISSN-0751-1353) Avail: NTIS HC A08/MF A01

The static characteristics of MOS transistor were obtained in the temperature range 10 to 100K. A model is developed to describe the set of conduction properties of the inversion layer with a single parameter. The dynamic behavior of the formation kinetics in the depleted substrate region is studied. A computerized simulation which includes the effects of the electric field results in a good quantitative representation of the kinetics of a depleted region formation, using as parameter the capture cross section of the hydrogen-type impurity. It is shown that the Frenkel-Pool effect is sufficient to explain the measurements at 20 to 30K and that at temperatures of the order 77K the characteristic time of the emission is < 1 p secured does not limit the formation of the depleted zone. Author (ESA)

N84-29323*# Massachusetts Inst. of Tech., Cambridge.
DEFECT INTERACTIONS IN GaAs SINGLE CRYSTALS Abstract Only
H. C. Gatos and J. Lagowski *In* NASA. Lewis Research Center Space Photovoltaic Res. and Technol. 1983 1984 p 111 (For primary document see N84-29307 19-44)
Avail: NTIS HC A12/MF A01 CSCL 20B

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N84-29782# Stanford Linear Accelerator Center, Calif.
PARTICEL SUBSTRUCTURE. A COMMON THEME OF DISCOVERY IN THIS CENTURY
W. K. H. Panofsky Feb. 1984 11 p Presented at the Cherwell-Simon Mem. Conf., Oxford, 8 May 1981 Submitted for publication
(Contract DE-AC03-76SF-00515)
(DE84-006776; SU-SLAC-PUB-3288; CONF-8105244-1) Avail: NTIS HC A02/MF A01

Some examples of modern developments in particle physics are given which demonstrate that the fundamental rules of quantum mechanics, applied to all forces in nature as they became

understood, have retained their validity. The well established laws of electricity and magnetism, reformulated in terms of quantum mechanics, exhibit a remarkable numerical agreement between theory and experiment over an enormous range of observation. as experimental techniques have grown from the top of a laboratory bench to the large accelerators of today, the basic components of experimentation have changed vastly in scale but only little in basic function. Specific topics addressed include: particle scattering, X-ray scattering, and electron scattering. R.S.F.

N84-29783# Loughborough Univ. of Technology (England). Dept. of Mathematics.
ALGEBRAICALLY SPECIAL, NONALIGNED NONNULL EINSTEIN-MAXWELL FIELDS
J. B. Griffiths May 1984 10 p refs
(MATHS-Res-178) Avail: NTIS HC A02/MF A01

A class of algebraically special nonnull electrovac solutions, in which the repeated principal null congruence is shear-free, twist-free and geodesic, and is not aligned with a principal null direction of the electromagnetic field is presented. This class includes all previously known solutions of this type as special cases. Author (ESA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N84-29784# Library of Congress, Washington, D. C. Science Reference Section.
WOMEN IN THE SCIENCES
Constance Carter, comp. Dec. 1983 14 p
(TB-83-8; ISSN-0090-5232) Avail: NTIS HC A02/MF A01

A guide to sources chronicling the history and contributions of women in the fields of science and engineering is presented. A.R.H.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N84-29785# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ANALYSIS OF THE ACQUISITION COSTS OF UNIQUELY-BUILT SPACECRAFT VERSUS MULTI-MISSION MODULAR SPACECRAFT SURROGATES FOR THE MILITARY SPACE PROGRAM OF THE 1970'S M.S. Thesis
L. M. Cole Dec. 1983 187 p
(AD-A141120; AFIT/GSO/OS/83D-2) Avail: NTIS HC A09/MF A01 CSCL 05/1

The purpose of the analysis was to determine and compare the costs of certain uniquely-built spacecraft of the 1970's with surrogate programs using the Multimission Modular Spacecraft. Using the Unmanned Spacecraft Cost Model, costs were developed for the unique satellites. After the feasibility of using the cost model was determined, the costs of the MMS were estimated from the cost model. Mission unique item costs such as, solar arrays, batteries, and communications equipment were also determined. The surrogate MMS program costs were simulated varying the quantity of modules built and the slope of the learning curve in building the modules. These costs compared with the estimated costs of the uniquely-built satellites, both aggregate and program, enabled a cost comparison of the 1970's military space program had the U.S. used the MMS exclusively. The analysis concludes with the determination that the MMS is a highly cost effective method of decreasing the cost of utilizing space when it is employed within its design criteria. Author (GRA)

N84-29786# Booz-Allen and Hamilton, Inc., Bedford, Mass.
LONEX (LABORATORY OFFICE NETWORK EXPERIMENT) COST/BENEFITS STUDY, VOLUME 1 Final Technical Report
Griffiss AFB, N.Y. RADC Apr. 1984 73 p 2 Vol.
(Contract F19628-78-C-0163; AF Proj. 9993)
(AD-A141396; RADC-TR-84-62-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 05/1

This report documents the results of an analysis of costs and benefits which are expected to accrue to the Rome Air Development Center (RADC) through the acquisition and implementation of an organizational office automation system. The report has two major parts: (1) Volume 1 - the LONEX Cost/benefits Study which describes the major findings and (2) Volume 2 - Appendix 3, Cost Benefits Analysis - A comparative cost analysis is presented in accordance with AFSC regulations and guidelines. The ground rules and assumptions underlying the analysis are detailed and comparisons are made using constant, inflated and discounted dollars for three cases: (1) present (no automation), (2) lease and (3) purchase. Author (GRA)

N84-29787# Booz-Allen and Hamilton, Inc., Bedford, Mass.
LONEX (LABOATORY OFFICE NETWORK EXPERIMENT) COST/BENEFITS STUDY, VOLUME 2 Final Technical Report
Griffiss AFB, N.Y. RADC Apr. 1984 94 p 2 Vol.
(Contract F19628-78-C-0163; AF Proj. 9993)
(AD-A141397; RADC-TR-84-62-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 05/1

The forecasts costs and benefits which will accrued through the implementation of a center-wide office automation system are detailed. The format is based on guidance contained in the Air Force Systems Command Manual 173-1, cost estimating procedures, and in Air Force Regulation 178-1, Economic Analysis and Program Evaluation. Author

N84-29788# Notre Dame Univ., Ind. Dept. of Economics.
EVALUATING THE AVAILABILITY, ROLE, AND PERFORMANCE OF SUBCONTRACTORS IN THE AEROSPACE INDUSTRY Final Report, 27 Sep. 1982 - 30 Jan. 1984
J. G. Beverly, F. J. Bonello, J. M. Daschbach, and W. I. Davisson
15 Jul. 1983 187 p
(Contract F33615-82-C-5121)
(AD-A141408; BRMC-82-C-5121) Avail: NTIS HC A09/MF A01 CSCL 05/1

This study examines the feasibility of developing a subcontractor database for use in industrial base identification and planning, and of the prime contractor decision to make or buy components from firms in the subcontract/vendor private portion of the defense industrial base. The project has three tasks: to identify aerospace subcontractors, to investigate databases on privately held firms and to examine prime contractor decisions to make or buy components from subcontractors or vendors. Beyond these three specific defined tasks, production base analysis is discussed as it relates to the consideration of databases, establishments and enterprises and make-or-buy decisions. Two points should be emphasized. First, there are strong parallels in the conceptual framework of production base analysis and acquisition planning. For both production base analysis and acquisition planning, it is most useful to take a broad, economy-wide perspective to industrial base considerations. Second, the demands for data are similar as well: production base analysis and acquisition planning both require product and production information. Both can be made more effective if supplemented with financial information. At the present time the same kinds of data limitations that constrain acquisition planning also constrain production base analysis. To this end, efforts to obtain more and better product, production and financial information for both public and private firms will provide dividends in a variety of areas. GRA

N84-29789# Defense Systems Management School, Fort Belvoir, Va.
PROGRAM MANAGER: THE JOURNAL OF THE DEFENSE SYSTEMS MANAGEMENT COLLEGE, VOLUME 13, NO. 2, MARCH - APRIL 1984

R. W. Moore Apr. 1984 45 p
(AD-A141770) Avail: NTIS HC A03/MF A01; SOD HC $4.75 CSCL 05/1

Topics discussed include second sources splits, warrantics, system support and readiness; night flow, program stability, budgeting and cost effectiveness. GRA

N84-29790# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
US ARMY RESEARCH INSTITUTE 1983 REPORT Annual Report, 1983
Oct. 1983 49 p
(AD-A141821) Avail: NTIS HC A03/MF A01 CSCL 05/1

An overview of the FY83 research program is presented in terms of these five research domains: Structure and Equip the Force, Man the Force, Train the Force, Develop Units, and Maintain Force Readiness. There are also sections on major awards, in-house publications, professional publications and presentations, FY83 program management (mission, the core program, the three component Laboratories and the Basic Research Office, and program resources), and messages from the Commander and the Technical Director. Author (GRA)

N84-29791# Brown Univ., Providence, R. I. Center for Dynamical Systems.
[RESEARCH IN THE AREAS OF STOCHASTIC CONTROL UNDER PARTIAL OBSERVATIONS, NONLINEAR FILTERING, LARGE DEVIATIONS FOR NEARLY DETERMINISTIC PROCESSES, AND TRANSITION AND INVARIANT DENSITIES FOR NEARLY DETERMINISTIC DIFFUSIONS] Interim Report, 30 Jun. 1982 - 29 Jun. 1983
Harold J. Kushner Feb. 1984 10 p
(Grant AF-AFOSR-0116-81)
(AD-A142191; AFOSR-84-0455TR) Avail: NTIS HC A02/MF A01 CSCL 05/1

The report summarizes progress in research supported by the grant during this period in the following areas: (1) stochastic control under partial observations; (2) nonlinear filtering; (3) large deviations for nearly deterministic processes; and (4) transition and invariant densities for nearly deterministic diffusions. A list of papers resulting from the research effort is included. Author (GRA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N84-29792# New South Wales Univ., Sydney (Australia).
THE IMPACT OF A COMPUTERIZED NETWORK ON THE QUALITY OF WORK LIFE IN TWO COLLEGE OF ADVANCED EDUCATION LIBRARIES IN NEW SOUTH WALES M.S. Thesis
Margaret Coffey 1982 160 p refs
Avail: NTIS HC A08/MF A01

The objective was to gather preliminary data on the impact of a computerized network (CLANN Limited) on the quality of work life of library staff in two college libraries. The expectations of the study were that network membership would affect the level of autonomous decision-making, the organizational structure, and the type and number of cataloguing staff required. Furthermore, the existing organizational climate and the method of implementing the technology were expected to be significant factors in the quality of the work experience. The case study method was selected. Data was gathered by way of semi-structured interviews with staff at all organizational levels of the two libraries, and with the CLANN office staff. The case studies confined the potential of the technology to influence the factors described above. However, the mission of the library and its management philosophy emerged as more significant than the technology. R.J.F.

N84-29793# National Technical Information Service, Springfield, Va. Center for the Utilization of Federal Technology.
DIRECTORY OF FEDERAL TECHNOLOGY RESOURCES, 1984
1984 238 p
(PB84-100015) Avail: NTIS HC A11/MF A01 CSCL 05B

More than 800 government laboratories, services, and facilities are listed which have the ability to offer technological assistance to the academic and business communities through the sharing of expertise, equipment, and facilities or as a reference source of information. Summaries of each resource are arranged in 30 subject categories. Subject resource, and geographical indexes are provided. Where appropriate, cross references are provided to other categories. A.R.H.

N84-29794# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A SYSTEM DYNAMICS APPROACH TO MEASURING THE VALUE OF INFORMATION M.S. Thesis
M. M. Kabil Dec. 1983 112 p
(AD-A141051; AFIT/GOR/OS/83D-6) Avail: NTIS HC A06/MF A01 CSCL 05/1

Developing a computerized national information system in Egypt is under investigation. The justification for introduction of such a system is discussed through a System Dynamics approach. The value of information is assessed by studying the effects of changes in information quality attributes on the national development process. The study provides a System Dynamics model of the national development process. Building upon the governmental policy for development, the model is divided into five main sectors; demographic, military, labor, capital, and housing sector. The five sectors are integrated and tested as a single unit. In the model construction, decisions are modeled as a combination of information flows describing the status and objectives of the system. Information entering a decision is assumed to be available with certain levels of accuracy and timeliness. Those levels are changed through two experiments of national development. Finally, recommendations are introduced for further research which will enhance the model's usefulness for both information evaluation and other policies of development. Author (GRA)

N84-29795# Stanford Univ., Calif. Dept. of Computer Science.
A NEW APPROACH TO DATABASE LOGIC
G. M. Kuper and M. Y. Vardi 1984 11 p
(Grant AF-AFOSR-0212-80; AF Proj. 2304)
(AD-A141130; AFOSR-84-0361TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper the authors propose a mathematical framework for unifying and generalizing the three principal data models, i.e., the relational, hierarchical and network models. Until recently most work on database theory has focussed on the relational model, mainly due to its elegance and mathematical simplicity compared to the other models. Some of this work has pointed out various disadvantages of the relational model, among them its lack of semantics and the fact that it forces the data to have a flat structure that the real data does not always have. In the model the authors propose here a database scheme is an arbitrary directed graph. As in the format model, leaves (i.e., nodes with no outgoing edges) represent data, and internal nodes have a function r on L, that assigns r-values to these l-values, and the authors require that the r-values be of the correct form, depending on the type of the node. GRA

N84-29796# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
ABSTRACTS OF ARI RESEARCH PUBLICATIONS FY 1983
Oct. 1983 96 p
(AD-A141440; ARI-TR-606) Avail: NTIS HC A05/MF A01 CSCL 05/10

Abstracts and bibliographic citations, including DTIC accession number, are given for 17 Research Reports, 36 Technical Reports, 80 Research Notes, and 20 Research Products released by the Army Research Institute during Fiscal Year 1983. All items are

indexed by author and corporate author and by subject area. The Federal depository libraries where the published reports may be obtained are also listed. GRA

N84-29797# Stanford Univ., Calif. Dept. of Computer Science.
A NOTE ON LOSSLESS DATABASE DECOMPOSITIONS
M. Y. Vardi 21 Dec. 1983 11 p
(Grant AF-AFOSR-0212-80; AF Proj. 2304)
(AD-A141488; AFOSR-84-0358TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

It is known that under a wide variety of assumptions a database decomposition is lossless if and only if the database scheme has a lossless join. Biskup, Dayal, and Bernstein have shown that when the given dependencies are functional then the database scheme has a lossless join if and only if one of the relation scheme is a key for the universal scheme. In this note the investigators supply an alternative proof of that characterization. The proof uses tools from the theory of embedded join dependencies and the theory of tuple and equality generating dependencies, but is, nevertheless, much simpler than the previously published proof. Author (GRA)

N84-29798# Logistics Management Inst., Washington, D. C.
LOCAL AUTOMATION MODEL: SYSTEM SPECIFICATION
W. P. Hamilton, III , R. W. Hartt, and D. J. OConnor Mar. 1984 135 p
(Contract MDA903-81-C-0166)
(AD-A141503; LMI-DL401) Avail: NTIS HC A07/MF A01 CSCL 05/2

This document contains a system specification for the Local Automation Model (LAM). The LAM will provide DoD Technical Libraries in the Shared Bibliographic Input Network a local automated information system to improve the management of DoD bibliographic information. The proposed system will replace the existing manual and batch procedures by technical library personnel. The system will provide automated storage of local bibliographic files and access to both local files and the DTIC Technical Reports Data base. Contained in this system specification are a summary of the system characteristics and requirements, a description of the system operating environment (including equipment, software, interfaces, and security) and a discussion of the design details (including general operating procedures, system logic flow, system data, and program descriptions). Author (GRA)

N84-29799# Defense Technical Information Center, Alexandria, Va.
FORMAT REQUIREMENTS FOR SCIENTIFIC AND TECHNICAL REPORTS PREPARED BY OR FOR THE DEPARTMENT OF DEFENSE
7 Nov. 1983 38 p Supersedes MIL-STD-847A dated 31 Jan. 1973
(AD-A141758; MIL-STD-847B; MIS-STD-847A) Avail: NTIS HC A03/MF A01 CSCL 05/1

This standard establishes format requirements for scientific and technical reports, including the DD form 1473, Report Documentation Page, prepared by or for the Departments and Agencies of the Department of Defense. Its provisions are mandatory for in-house, contractor, or grantee reports according to the Defense Directives and Instructions. Its purpose is to aid the dissemination and secondary distribution of reports; to reduce the costs of preparing, storing, retrieving, reproducing, and distribution of reports; and to aid the interchanged of scientific and technical information with the research and development community. Author (GRA)

N84-29800# Naval Postgraduate School, Monterey, Calif.
PERFORMANCE EVALUATION TOOLS FOR A MULTI-BACKEND DATABASE SYSTEM M.S. Thesis
J. G. Kovalchik Dec. 1983 69 p
(AD-A141786; AD-E750818) Avail: NTIS HC A04/MF A01 CSCL 09/2

The basic motivation of the multi-backend database system (MDBS) is to develop an architecture which spreads the work of the database system among multiple backends. It is a major aim of this system to allow capacity growth by the use of additional disk drives and performance improvement by the use of additional backends. However, to verify the design and implementation, it is necessary to test the capability of MDBS in capacity growth and performance gain. Three tools for the performance and capacity tests are investigated. The first tool is the file generation package which creates test files for any artificial database. The second tool is the database load subsystem which loads the artificial database into MDBS. The third tool is the request generation package. This package creates test requests to query MDBS. The following methodology is used to create an effective tool. First, the properties of an ideal tool are described. Then available existing programs are reviewed and evaluated to determine which program best meets the desired features. Lastly, the programs are upgraded to ensure that they are compatible with the current implementation, and meet the desired features. The main goal is to develop the necessary tools to generate tests in measuring the extensibility of MDBS. GRA

N84-29801# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES. VOLUME 38, NUMBER 6
L. E. Shaffer Jun. 1984 65 p
(AD-A142175; ESN-38-6) Avail: NTIS HC A04/MF A01 CSCL 05/2

European Scientific Notes (ESN) is a monthly publication with brief articles on recent developments in European scientific research. Articles included in this publication pertain to: Behavioral Sciences; Biological Sciences; Computer Sciences; Earth Science; Education; Engineering; Environmental Sciences; Material Sciences; Ocean Sciences; Physics; Science Policy; Space Science. GRA

N84-29802# General Electric Co., St. Petersburg, Fla. Neutron Devices Dept.
SUCCESS WITH DATA MANAGEMENT 4 AT THE DOE PINELLAS PLANT
M. A. Denty 1983 13 p Presented at the Honeywell Large Systems Users Assoc. Forum 37, San Diego, Calif., 16 Oct. 1983
(Contract DE-AC04-76DP-00656)
(DE84-008021; GEPP-OP-754a; CONF-8310260-1) Avail: NTIS HC A02/MF A01

The data management design and implementation approach used on-line systems are described. One system supports purchasing and general stockroom; the other supports engineering product configuration definition and engineering drawing distribution control. Data base administration practices, transaction processing considerations, and data base design techniques, as well as the applications themselves. Problems solved and pitfalls avoided. DOE

N84-29803# Sandia Labs., Albuquerque, N. Mex. Static and Shock Testing Div.
OPERATIONS MANUAL FOR THE DATA ACQUISITION AND REDUCTION SYSTEM, AREA III ACTUATOR TEST FACILITY
Ervin L. Smith Mar. 1984 63 p
(Contract DE-AC04-76DP-00789)
(DE84-008906; SAND-83-2205) Avail: NTIS HC A04/MF A01

This manual describes the operation of a minicomputer-based data acquisition and reduction system. The stand-alone digital system can alleviate current problems with test control and analysis and with data presentation. In its initial configuration, it can digitize test results recorded on FM tape and present the data graphically for reports. The ultimate goal of this system is to upgrade the performance, safety, and turnaround time of actuator tests through improved quality, analysis, and presentation of data. DOE

N84-29804# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.
GENERAL PRINCIPLES IN TEXT ANALYSIS
Hans Furustig Mar. 1984 41 p refs In SWEDISH; ENGLISH summary
(FOA-C-56042-H2; ISSN-0347-7665) Avail: NTIS

HC A03/MF A01

A model for information analysis is presented, consisting of steps referred to as: background analysis; content analysis including interpretation and description of the information structure; examination; and evaluation. The model is expanded to a checklist for text analysis. It incorporates the most important factors (e.g., psychological defense) to be scrutinized during text analysis and to be observed during text production. Author (ESA)

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N84-29805*# Garrett Turbine Engine Co., Phoenix, Ariz.
ADVANCED GAS TURBINE (AGT) Semiannual Progress Report, Jan. - Jun. 1983
Dec. 1983 78 p refs
(Contract DEN3-167)
(NASA-CR-174694; DOE/NASA/0167-7; NAS 1.26:174694; GARRETT-31-3725(7); SAPR-7) Avail: NTIS HC A05/MF A01 CSCL 13F

The development and progress of the Advanced Gas Turbine engine program is examined. An analysis of the role of ceramics in the design and major engine components is included. Projected fuel economy, emissions and performance standards, and versatility in fuel use are also discussed. M.A.C.

88 SPACE SCIENCES (GENERAL)

N84-29806# Sao Paulo Univ. (Brazil). Inst. of Astronomics and Geophysics.
THE MOTION OF PLANETS AND NATURAL AND ARTIFICIAL SATELLITES, VOLUME 2
S. Ferraz-Mello, ed. and P. E. Nacozy, ed. (Texas Univ., Austin) 1983 303 p refs In ENGLISH and FRENCH Symp. held in Embu, Brazil, 14-18 Dec. 1981 *Its* Math. and Dyn. Astronomy Ser.
Avail: NTIS HC A14/MF A01

This volume contains the text of the papers presented at an International Symposium on the Motion of Planets and Natural and Artificial Satellites. The material of the symposium was organized into four basic areas: (1) Mathematical Techniques and Problems; (2) Numerical Techniques; (3) Artificial Satellites and (4) The Solar System. The workshop consisted of two sessions on Artificial Satellites Dynamics Control, and Rings and two sessions on Artificial Satellites Dynamics Control, Analytical and Numerical Methods. For individual titles, see N84-29807 through N84-29839.

N84-29807# Universidade Federal de Pernambuco, Recife (Brazil). Dept. de Matematica.
PERIODIC AND QUASI-PERIODIC MOTIONS IN TRIPLE STELLAR SYSTEMS **c90**
Hildeberto E. Cabral *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 3-9 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

The isosceles solution of the Newtonian three-body problem with a symmetry axis is considered. This is the solution where two particles of equal masses m sub 1=m sub 2=m move symmetrically with respect to an axis of a given inertial barycentric coordinate system and the third particle of mass m sub 3 moves always on this axis. The existence of such a solution of the three-body problem is a classical fact. B.W.

N84-29808# Graz Univ. (Austria). Inst. fuer Astronomie.
ON THE TWO-BODY PROBLEM WITH VARIABLE MASSES **c90**
R. Dvorak and H. Lichtenegger *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 11-17 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

In this paper the problem of the motion of two bodies with variable masses is treated for different mass variations. For an exponential mass increase (decrease) a first order approximation is presented. The general case of the two-body problem with variable masses is then solved with the Lie series as a numerical integration method. B.W.

N84-29809# Universidade Estadual de Paulista, Guaratingueta (Brazil). Dept. de Matematica.
STABILITY OF EQUILIBRIUM IN PROBLEMS WITH DOUBLE RESONANCE **c64**
Maria Helena Carrijo de Faria Lacaz *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 19-25 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

The "2-pendulum system' is obtained by linearizing double resonance problems. The stability of the 2-pendulum system associated to the Yokoyama's problem is studied in this paper. B.W.

N84-29810# Northwestern Univ., Evanston, Ill. Dept. of Mathematics.
AN EQUALITY WHICH YIELDS ZERO VELOCITY SURFACES **c90**
Donald G. Saari *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 27-38 refs Sponsored in part by NSF (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

Zero velocity curves which have played an important role in analyzing problems from celestial mechanis are discussed. This is particularly so for those qualitative problems involving whether or not certain particles can escape, stability analysis, etc. The most famous of these restrictions are the Hill curves which arise in the circular restricted three body problem. These curves determine regions in configuration space where the infinitesimal particle can or cannot go, and they have played an important role in analyzing problems from dynamical astronomy. A similar type result occurs in the artificial Earth satellite problem when the model of the Earth satisfies certain symmetry conditions; usually that the Earth is symmetrical with respect to the z-axis. Again, these results restrict the regions of configurations space in which the satellite

can be. These restrictions are in terms of the total energy of the system, the angular momentum, and the magnitude of the moment of inertia. Finally, this result has been extended to the general n-body problem, but the analysis of what this means about restrictions on the types of configurations admitted by the particles is not as complete. B.W.

N84-29811*# Texas Univ., Austin. Dept. of Aerospace Engineering.
STABILITY AND CAPTURE OF ASTEROIDS c91
V. Szebehely *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 39-46 refs Sponsored in part by NSF (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

The problem of stability of asteroids is treated from the point of view of Hill's stability-concept and using Lyapunov's Characteristic Numbers. The quantitative measure of stability (S) introduced earlier is evaluated for over 300 asteroids and a surprisingly simple relation is established between the semi-major axes of some of the asteroids' orbits and S. A detailed analysis is presented of the Lyapunov Characteristic Numbers for two minor planets and the time-variation of these numbers is discussed. The technology of capture of asteroids is vitally dependent on their orbital stability, therefore, these two problems, i.e., capture and stability, are closely related. In fact, some predictable instabilities may be properly utilized to capture and/or change asteroidal orbits to accomplish collisions with the Earth. Author

N84-29812# National Observatory, Rio de Janeiro (Brazil).
LAGRANGIAN SINGULARITIES: APPLICATIONS c64
Roberto Vieira Martins *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 47-54 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

Some results about the behavior of trajectories of a Hamiltonian system in configuration space are presented. The results are the outcomes of the theories of Lagrangian manifolds and of focal points. Some definitions of the Lagrangian manifold, and Lagrangian singularities are given. B.W.

N84-29813# Sao Paulo Univ. (Brazil). Dept. de Astronomia.
FORMAL SOLUTIONS IN A DOUBLE RESONANT PROBLEM c64
T. Yokoyama *In its* The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 55-61 refs Sponsored in part by National Council of Research of Brazil and the Research Foundation of Sao Paulo (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

An example of a double resonant problem is presented whose associated 2-pendulum is integrable. The possibility of constructing formal solutions by taking the 2-pendulum as an intermediate orbit is numerically analyzed by the method of surfaces of section.B.W.

N84-29814# Graz Univ. (Austria). Inst. fuer Astronomie.
NUMERICAL INTEGRATION WITH LIE-SERIES c64
R. Dvorak and A. Hanslmeisr *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 65-72 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

Lie-series are applied to the two body and the general three body problem as a numerical integration method. Since it is easy to compute even higher Lie-terms bigger step length can be used in order to save computing time as well as to keep small round off errors. As shown in a simple example also non conservative systems can be treated with the Lie-integration. Author

N84-29815# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A STOCHASTIC APPROACH TO GLOBAL ERROR ESTIMATION IN THE NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS c64
A. Rios Neto and N. C. Cardenuto *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 73-81 refs Previously announced as N82-18944 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

A stochastic scheme is proposed to estimate the order of magnitude global errors in the numerical integration of ordinary differential equations initial value problems. A Markov stochastic vector sequence modeled with variances in each discretization time that constrains the order of magnitude of the global error vector components to be within estimated limits with 99% probability. This is done by properly discretizing the dynamic given by the system first order variational equations and by properly perturbing the dynamics with white noise derived from local estimates of truncation and round off errors. The procedure to implement the scheme when Runge-Kutta embedded formulas of the consecutive orders are used is presented. S.L.

N84-29816# Sao Paulo Univ. (Brazil). Dept. de Astronomia.
A NUMERICAL AVERAGING PROCEDURE FOR THE GALILEAN SATELLITES SYSTEM c64
M. Sato, S. Farraz-Mello, and P. E. Nacozy (Texas Univ., Austin) *In its* The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 83-89 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

A method of numerical integration is developed to obtain the long term motion of the Galilean Satellites of Jupiter. The short periodic perturbation are removed from the disturbing forces by employing numerical and seminumerical averaging techniques. The advantages and disadvantages of either one or other averaging have been discussed in a previous publication. Author

N84-29817# Comision Nacional de Investigaciones Espaciales, San Miguel (Argentina). Centro Espacial.
A METHOD FOR THE ESTIMATION OF SMALL PERTURBATIONS c13
Pedro E. Zadunaisky *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 91-102 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

A technique is developed for detecting, directly from observations, the presence and magnitude of small forces affecting the motions of bodies in their orbits. Its application might be extended to any problem involving small perturbation. Author

N84-29818# Universidade Federal de Parana, Curitiba (Brazil). Dept. de Fisica.
DRAG ON GEODYNAMIC SATELLITES c15
G. B. Afonso and Liu Kai *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 105-116 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

High precision laser measurements on artificial satellites moving at altitudes greater than 3000 km, reveal that the effect of drag cannot be neglected in calculations of secular variations of orbits. High altitude atmospheric resistance to the satellites was modeled as drag on a sphere moving in rarefied gases (molecules, ions and electrons) with very large Knudsen numbers. The neutral drag is expressed in terms of the mean square relative velocity of the gas particles as observed on a moving sphere and based on gas kinetic considerations. Electric drag was also analyzed. Calculations were carried out for drag on the laser geodynamic satellite which has a secular reduction of its semi-major axis of the orbit of the order of 1.1 mm/day with the modified equations for both neutral drag and electric drag. It is found that the dominant term in the computation of total drag on geodynamic satellites is the electric drag. Author

N84-29819# Naval Research Lab., Washington, D. C.
SATELLITE ORBIT THEORIES BASED ON THE ELIMINATION OF THE PARALLAX c15
S. L. Coffey and K. T. Alfriend *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983

p 117-126 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

An analytic theory and the framework for a semi-analytic theory for the motion of an artificial satellite under the influence of the Earth's gravitational field are developed. The theories are developed to third order in the Hamiltonian. Closed form expressions for the zonal short period transformations are obtained but eccentricity expansions for tesseral short period transformations are necessary. The theories are valid for satellites whose periods are not in resonance with the rotation rate of the Earth and are not at the critical inclination. A.R.H.

N84-29820# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
INCLINED GEOSYNCHRONOUS SATELLITES c15
Paul E. Nacozy *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 127-131 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

The characteristics of long term motion of stationary and geosynchronous satellites are described. Nonstationary satellites with an inclined, eccentric (nonzero inclination and nonzero eccentricity) orbit, and with an inclined (nonzero inclination) nearly circular (zero eccentricity) orbit are discussed. The nodal rate is considered. A.R.H.

N84-29821# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AN ADAPTIVE SATELLITE ORBIT ESTIMATION SCHEME USING AN ANALYTICAL APPROACH AND A DYNAMICAL MODEL COMPENSATION TECHNIQUE c13
A. Rios Neto and R. Negreiros dePaiva *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 133-146 ref Previously announced as N82-18270 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

An Earth satellite orbit estimation procedure for real time applications is presented. A perturbed two body physical model is considered for the satellite equations of motion in the mathematical model of the estimator. Using the KS transformation, an analytical solution is obtained in the correspondent parametric transformed space. the perturbations in the Keplarian motion are treated, in the parametric space, as unmodeled accelerations. A dynamical model compensation technique approximates each component of these accelerations by a first order Gauss-Markov process. These accelerations are estimated along with the satellite motion by the definition of an extended state, using the extended Kalman filter. During the estimation process, the observations, nonlinearities and the state noise covaiance matrix are adaptively determined to prevent filter divergence. Results of numerical tests under simulated conditions are presented and discussed. Author (IAA)

N84-29822# Computer Technology Associates, Inc., Englewood, Colo.
THE NEST GENERATION IN SATELLITE FLIGHT CONTROL SYSTEMS c15
C. E. Velez *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 147-164 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

An advanced satellite operations center (ASOC) is examined which features fourth generation computer hardware and a modern system and flight dynamics architecture. The functions of the ASOC include the command and control of a full spectrum of satellite types, orbit management for these satellites, attitude control, and satellite subsystems management. The ASOC will allow the handling of an increased volume of space traffic and will improve operations and indirectly reduce operating costs by centralizing the data processing element which includes the functions of real time, interactive control of space vehicles and ground resources from autonomous mission control centers (MCC), real time processing of telemetry, tracking and status data. Analysis and control functions include computer interactive planning and evaluation functions and centralized control of network resources via a Range Control Center (RCC). M.A.C.

N84-29823# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A RAPID ESTIMATION OF NEAR EARTH SATELLITE LIFETIMES WITH QUASI-DYNAMIC ATMOSPHERIC MODEL WITH APPLICATION TO A PROPOSED BRAZILIAN SATELLITE c15
Nellore S. Venkataraman and Kondapalli Rama Rao (Inst. de Planejamento e Estudos Ambientais) *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 165-174 refs Previously announced as N82-18272 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

A method to estimate the orbital lifetime of near Earth satellites using the small perturbation theory is presented. A quasidynamic atmospheric model is used by employing different exospheric temperature every three months. The drag coefficient is calculated using kinetic theory. The results are validated by applying to several known satellites and comparison with the actual lifetime is very good. The method is then applied to a proposed Brazilian Satellite. Author (IAA)

N84-29824# Instituto Tecnologico de Aeronautica, Sao Jose dos Campos (Brazil). Dept. de Astronomia.
COMMENT ON COUPLED PERTURBATIONS ON ORBITS OF ARTIFICIAL EARTH SATELLITES c13
R. Vilhena deMoraes and M. T. R. Fitzgibbon *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 175-182 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

A practical formulation of Lagrange method is proposed to study the effects of coupled polygenic monogenic forces on orbits of artificial satellites. This algorithm can be employed for translational and rotational motion of a satellite. An application to the coupling Air drag Earth oblateness is made. M.A.C.

N84-29825# Bureau des Longitudes, Paris (France).
NEW EPHEMERIDES FOR THE GALILEAN SATELLITES OF JUPITER CALCULATED FROM SAMPSON-LIESKE THEORY c89
J. E. Arlot *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 185-196 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

An adjustment of Sampson/Lieske's theory is made with a large set of photographic observations (8856 individual observations). A new ephemeris is built. This ephemeris and others are compared with some series of photographic observations and with observations of mutual phenomena. M.A.C.

N84-29826# Bureau des Longitudes, Paris (France).
THE S-9 EPHEMERIDE OF PHOEBE WITH AN ANALYSIS PF THE OBSERVATION [EPHEMERIDE DE PHOEBE (S IX) AVEC ANALYSE DES OBSERVATIONS] c89
A. Bec-Borsenberger *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 197-200 refs In FRENCH; ENGLISH summary (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

The observations of Phoebe (from 1904 to 1976), are collected, a numerical integration is computed and the initial conditions are adjusted to the observations. A numerical study of the planetary perturbations demonstrate that to attain a precision of 1/10 sec. the effect due to Jupiter must be considered. With the final integration obtained, initial conditions adjusted and taking into account the planetary perturbations, and ephemeris is for Phoebe. M.A.C.

N84-29827# Cornell Univ., Ithaca, N.Y.
THE PUZZLING DYNAMICS OF SATURN'S F-RING c91
J. A. Burns and M. R. Showalter *In* Sao Paulo Univ. The Motion

of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 201-213 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

Observations of the F-ring, a narrow and variable band detached from the main Saturnian ring system, are summarized. The ring lies between two small satellites; some consequences of perturbations from these nearby satellites are described and show that a perturber on an eccentric orbit produces effects distinct from a perturber of a circular orbit. Processes active on the common submicron component which has a limited lifetime and dynamics affected by electromagnetic forces are discussed. The observed ring structure varies in an as-yet unexplained manner. Author

N84-29828# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
MINOR PLANET OBSERVATIONS AND A DYNAMICAL REFERENCE SYSTEM c89
R. L. Duncombe and P. D. Hemenway *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 215-224 refs (For primary document see N84-29806 19-88) (Grant NSF AST-79-16870)
Avail: NTIS HC A14/MF A01

Development of the NASA Space Telescope and the European HIPPARCOS Telescope in addition to the application of new measurement and reduction techniques to ground-based observations holds the promise for a significant improvement in astrometric accuracy. Methods to combine Space Telescope and ground-based observations to establish an interlocking net of orbits of minor planets whose dynamical motions are used to probe the systematic accuracy of the Fundamental Reference System are examined. Author

N84-29829# Sao Paulo Univ. (Brazil). Dept. de Astronomia.
GALILEAN SATELLITES: OBSERVATIONS, EPHEMERIDES AND THEORIES c89
S. Ferraz Mello *In its* The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 225-231 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

The best available ephemerides are those obtained using the Lieske's elements E-2 and the Lieske-Sampson theory, that were shown to have a precision of around 200 km at the epoch of the Voyager fly-by. Two theories were completed in this century, those of Sampson and DeSitter, but all available ephemerides are founded on the Sampson theory in either its original or modern forms. New techniques are being used to construct actual theories of motions of the satellites. Current theoretical efforts may lead to a new theory more complete than Sampson's theory. However, progress is slow. In the meantime Sampson's ephemerides are greatly improved by the fact that good modern observations are available. B.G.

N84-29830# Facultes Universitaires Notre-Dame de la Paix, Namur (Belgium). Dept. of Mathematics.
ORBITAL EVOLUTION OF THE GALILEAN SATELLITES: THE CONSERVATIVE MODEL c91
Jacques Henrard *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 233-244 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

Resonances between the mean motions of satellites are so common in the solar system that it is believed that many of them are the results of an evolutionary process involving non conservative forces. The most likely candidate is the tidal forces acting on non perfectly elastic bodies. Other resonances may be primordial and due to an enhancement of the probability of formation of satellites in resonance with others already formed. The mechanisms which would favor such an enhancement are not well understood yet. Studies of plausible scenarios of capture in resonance of evolution of resonances gives us a better understanding of some of the physical processes acting in the solar system and of its primordial state. One of the most interesting (and the most difficult) resonances is the one involving the three first Galilean satellites of Jupiter Io, Europe and Ganymede. It would be useful to derive in a more systematic way and if possible to sharpen the mathematical model. B.G.

N84-29831*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MISSION AND TRAJECTORY DESIGN FOR THE VENUS ORBITING IMAGING RADAR c12
Johnny H. Kwok *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 245-252 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

Results of mission and trajectory design for the Venus Orbiting Imaging Radar are presented. Because of the application of the aerobraking technique, for the first time to a planetary mission, the conventional mission design criteria in the selection of the launch/arrival dates must be modified and new mission constraints must be imposed. Venus itself poses an interesting aspect in trajectory design for an orbiting spacecraft due to its dense lower atmosphere and its slow retrograde rotation. Some recent results in the method of averaging applied to an orbiting spacecraft about this unique planet are given. Author

N84-29832# Naval Observatory, Washington, D.C.
OBSERVATIONS OF FAINT PLANETARY SATELLITES WITH A CHARGE-COUPLED DEVICE c89
D. Pascu, P. K. Seidelmann, W. A. Baum (Lowell Observatory), and R. E. Schmidt *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 253-262 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

Photographic techniques have proved highly successful in the astrometric observation of the majority of planetary satellites. There are, however, some satellites with a poor observational history because they are difficult to detect. These include the fainter outer moons of Jupiter as well as Janaus, and Nereid. The list of hard to detect satellites has more than doubled, due largely to the Voyager discoveries in the Jovian and Saturnian systems and to discoveries made during the ground-based observations of the 1980 Saturn ring plane crossing by Earth. Reobservation of some of these new satellites will have to await the launching of the Space Telescope in the middle 1980's, but for the remainder, ground based observation will be more available and more advantageous because of greater flexibility in scale selection, filter selection and the use of coronagrphic techniques. New observational techniques to be used with the wide field/planetary camera (WF/PC) of space telescope (ST) to observe the planetary satellite systems were investigated. Author

N84-29833# Sao Paulo Univ. (Brazil). Dept. de Astronomia.
A 2:1 COMMENSURABILITY IN URANUS-NEPTUNE SYSTEM c91
W. Sessin (Inst. Tecnologico de Aeronautica, Sao Jose dos Campos) and M. Tsuchida *In its* The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 263-272 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

The complete solution of the dynamical system that includes the effects of 2:1 commensurability among two planets around the Sun is discussed by using non-singular variables. An application of the model is made to the Uranus-Neptune system. The type of the motion is circulatory and its period is about 4,230 years. An analysis of the periods is presented for a system of planets similar to Uranus and Neptune, and the classification of the different types of libratory and circulatory motions cannot be based on the periods. Author

N84-29834# Bureau des Longitudes, Paris (France).
ANALYTICAL THEORY OF THE MOTION OF THE GALILEAN SATELLITES OF JUPITER: THE FIRST APPROXIMATION c91
W. Thuillot and D. T. Vu *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 273-294 refs (For primary document see N84-29806 19-88)

Avail: NTIS HC A14/MF A01

The development of a first approximation of an analytical theory of Galilean Satellites is presented. This approximation, labeled S-A, uses the equations of second order. The autonomous system and the critical one give long period motions of the nodes and perijoves and allow the construction of the general solution. The analytical results are reduced to numerical tables of longitudes, radius vector and latitudes for an easy comparison with Sampson's tables and Lieske's E/0 tables. M.A.C.

N84-29835# Bureau des Longitudes, Paris (France).
OBSERVATIONS OF MUTUAL PHENOMENA OF THE GALILEAN SATELLITES OF JUPITER IN 1979-1980 Abstract Only **c91**
J. E. Arlot *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 297 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

Mutual phenomena of the Galilean Satellites of Jupiter are examined. The conjunction of Jupiter with the Sun occurred during the most favorable period for those phenomena so that the possibilities of observations are poor. Observations are made in order to observe as many of those phenomena as possible. Nine phenomena are observed. Analysis is possible for eight of them. Fourteen light curves are obtained with a classic photometer in several wavelengths (0.62 microns, 0.73 micrometers, 0.89 micrometers. U, B, V) and six with a TV camera, a photographic camera or visually. After the observations, a comparison is made with four different predictions. Differences observations minus theory in longitude are calculated for the observed satellites. M.A.C.

N84-29836# Sao Paulo Univ. (Brazil). Escola Politenica.
A NOTE ABOUT LIE SERIES AND SOME APPLICATIONS Abstract Only **c64**
G. E. O. Giacaglia *In its* The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 298 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

First integrals of motion, as given by Lie Series, are power series in time which convergence absolutely and uniformily, provided the right hand members of the differential equations are analytic in a certain domain. The basic properties are collected and examples given of application to nonautonomous oscillators. M.A.C.

N84-29837# Sao Paulo Univ. (Brazil). Escola Politecnica.
A SIMPLE THEORY OF TROJAN ASTEROIDS Abstract Only **c91**
G. E. O. Giacaglia *In its* The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 299 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

The motion of an asteroid in the neighborhood of Jupiter's orbit, in the case of small eccentricity and inclination, is reduced to a system with one degree of freedom. The corresponding singular trajectories are identified and defined by the energy constant in a rotating frame of reference. M.A.C.

N84-29838# Communications Satellite Corp., Washington, D.C. Astrodynamics Dept.
COLOCATION STATIONKEEPING OF GEOSTATIONARY SATELLITES Abstract Only **c15**
Victor J. Slabinski *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 300 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

The objective of colocation stationkeeping of two communications satellites in geostatonary orbit is to keep the satellites sufficiently close together in space so that they both appear within the narrow radio beam of all Earth station antennas communicating through the satellites. The maneuver strategy is presented. Maneuver plans are based on orbits derived from Earth station range and angle data. Every month or two, ground commanded thruster firings give a single velocity-impulse to each satellite which adjusts their longitude drift rates; this maintains them within their longitude limits with a satellite separation in mean longitude of approximately 0.03 degrees. The proper timing of each impulse keeps the two orbit centers in close proximity in spite of differing solar radiation perturbations, with no additional expenditure of propellant. A nearly identical diurnal oscillation in longitude is maintained due to the orbit eccentricity. M.A.C.

N84-29839# Paris VI Univ. (France).
PERIODIC ORBITS AND LIBRATION IN THE MIMAS-TETHYS CASE Abstract Only **c13**
I. Stellmacher *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 301-302 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

An algorithm allowing the construction of periodic orbits in a rotating frame for satellites moving around an oblate planet is described. When the inclinations of the orbits are small, the solutions can easily be calculated. These periodic solutions are used as generating orbits in the MIMASTETHYS case: (1) Without resonance, it is possible to find a rotating system in which the solution is a periodic one; (2) including the resonant terms and assuming an exact commensurability of the implied frequencies, the solution still is a periodic one, thus all the conjunctions occur in either axis. The equation of the libration can be established. M.A.C.

N84-29840*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A BIBLIOGRAPHY OF PLANETARY GEOLOGY PRINCIPAL INVESTIGATORS AND THEIR ASSOCIATES, 1982 - 1983
J. B. Plescia Aug. 1984 34 p
(NASA-TM-86249; NAS 1.15:86249) Avail: NTIS HC A03/MF A01 CSCL 03A

This bibliography cites recent publications by principal investigators and their associates, supported through NASA's Office of Space Science and Applications, Earth and Planetary Exploration Division, Planetary Geology Program. It serves as a companion piece to NASA TM-85127, "Reports of Planetary Programs, 1982'. Entries are listed under the following subject areas: solar system, comets, asteroids, meteorites and small bodies; geologic mapping, geomorphology, and stratigraphy; structure, tectonics, and planetary and satellite evolutions; impact craters; volcanism; fluvial, mass wasting, glacial and preglacial studies; Eolian and Arid climate studies; regolith, volatiles, atmosphere, and climate, radar; remote sensing and photometric studies; and cartography, photogrammetry, geodesy, and altimetry. An author index is provided. A.R.H.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N84-29841*# Rice Univ., Houston, Tex.
IMAGERY AND SPECTROSCOPY OF SUPERNOVA REMNANTS AND H-2 REGIONS Annual Report, 1 May 1983 - 30 Apr. 1984
Reginald J. Dufour 5 Jun. 1984 13 p refs
(Contract NAS9-16596)
(NASA-CR-171799; NAS 1.26:171799) Avail: NTIS HC A02/MF A01 CSCL 03A

Research activities relating to supernova remnants were summarized. The topics reviewed include: progenitor stars of supernova remnants, UV/optical/radio/X-ray imagery of selected regions in the Cygnus Loop, UV/optical spectroscopy of the Cygnus Loop spur, and extragalactic supernova remnant spectra. R.S.F.

N84-29842*# Texas Univ., Austin. Dept. of Astronomy.
[NASA-TEXAS PLANETARY PROGRAM]
Harlan J. Smith 30 Jun. 1984 22 p refs
(Grant NGR-44-012-152)

(NASA-CR-173798; NAS 1.26:173798) Avail: NTIS HC A02/MF A01 CSCL 03A

Astronomical observations performed at the McDonald Observatory were summarized. Various spectra obtained from Jupiter, Uranus, Saturn, Neptune, Pluto, Titan, Iapetus, and sundry asteroids were described briefly. Spectra taken of various comets using an IDS (Intensified Dissector Scanner) spectrograph on a 2.7 m telescope were reviewed. The Octicon, a linear array of eight 1872-element Reticon arrays that was installed in the 2.7 m coude spectrograph at the observatory, was described. The 2.7 m coude scanner, 2.7 m coude CCD (charge coupled device), and 2.7 m radial velocity spectrometer were mentioned. R.S.F.

N84-29825# Bureau des Longitudes, Paris (France).
NEW EPHEMERIDES FOR THE GALILEAN SATELLITES OF JUPITER CALCULATED FROM SAMPSON-LIESKE THEORY
J. E. Arlot *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 185-196 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29826# Bureau des Longitudes, Paris (France).
THE S-9 EPHEMERIDE OF PHOEBE WITH AN ANALYSIS PF THE OBSERVATION [EPHEMERIDE DE PHOEBE (S IX) AVEC ANALYSE DES OBSERVATIONS]
A. Bec-Borsenberger *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 197-200 refs In FRENCH; ENGLISH summary (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29828# Texas Univ., Austin. Dept. of Aerospace Engineering and Engineering Mechanics.
MINOR PLANET OBSERVATIONS AND A DYNAMICAL REFERENCE SYSTEM
R. L. Duncombe and P. D. Hemenway *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 215-224 refs (For primary document see N84-29806 19-88) (Grant NSF AST-79-16870)
Avail: NTIS HC A14/MF A01

N84-29829# Sao Paulo Univ. (Brazil). Dept. de Astronomia.
GALILEAN SATELLITES: OBSERVATIONS, EPHEMERIDES AND THEORIES
S. Ferraz Mello *In its* The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 225-231 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29832# Naval Observatory, Washington, D.C.
OBSERVATIONS OF FAINT PLANETARY SATELLITES WITH A CHARGE-COUPLED DEVICE
D. Pascu, P. K. Seidelmann, W. A. Baum (Lowell Observatory), and R. E. Schmidt *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 253-262 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N84-29807# Universidade Federal de Pernambuco, Recife (Brazil). Dept. de Matematica.
PERIODIC AND QUASI-PERIODIC MOTIONS IN TRIPLE STELLAR SYSTEMS
Hildeberto E. Cabral *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 3-9 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29808# Graz Univ. (Austria). Inst. fuer Astronomie.
ON THE TWO-BODY PROBLEM WITH VARIABLE MASSES
R. Dvorak and H. Lichtenegger *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 11-17 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29810# Northwestern Univ., Evanston, Ill. Dept. of Mathematics.
AN EQUALITY WHICH YIELDS ZERO VELOCITY SURFACES
Donald G. Saari *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 27-38 refs Sponsored in part by NSF (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N84-29843*# California Inst. of Tech., Pasadena. Seismological Lab.
SHOCK VAPORIZATION AND THE ACCRETION OF THE ICY SATELLITES OF JUPITER AND SATURN
Thomas J. Ahrens and John D. OKeefe [1984] 44 p refs (NASA-CR-173767; NAS 1.26:173767) Avail: NTIS HC A03/MF A01 CSCL 03B

The role of impact vaporization acting during the formation of the Jovian and Saturnian satellites is examined in an attempt to explain the observed density in terms of composition of these rock and ice objects. A hypothesis is examined which states that the smaller satellites of Saturn having mean densities in the 1.1 to 1.4 Mg/cu m range represent primordial accreted planetesimal condensates formed in the proto-Jovian and Saturnian accretionary planetary discs. These densities are in the range expected for water-ice/silicate mixtures constrained in the solar values of O/Si and O/Mg atomic ratios. It is demonstrated that if the large satellites accreted from the same group of planetesimals which formed the small Saturnian satellites impact vaporization of water upon accretion in a porous regolith, at low H2O partial pressure, can account for the increase in mean planetesimal density from 1.6 Mg/cu m (43% H2O + 57% silicate) to a mean planetary density of 1.9 Mg/cu m for Ganymedean-sized water silicate objects. If impact volatilization of initially porous planetesimals is assumed, it can be demonstrated starting with planetesimals composed of 54% H2O and 40% silicate partial devolatilization upon accretion will yield a Ganymede-sized planet, having a radius of 2600 km and a density of 1.85 kg/cu m, similar to that of Ganymede, Callisto, and Titan. M.G.

N84-28845# Joint Publications Research Service, Arlington, Va.
GUARANTEED ACCURACY IN DETERMINING ORBIT OF HALLEY'S COMET Abstract Only
A. A. Sukhanov and P. Y. Elyasberg *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 67 Transl. into ENGLISH from Kosmich. Issled, (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 868-875 Original language document announced as A84-19731 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28855# Joint Publications Research Service, Arlington, Va.
VENERA-15, -16 RADAR IMAGERY OF VENUS
O. N. Rzhiga *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 74-76 Transl. into ENGLISH from Zemlya Vselennaya (USSR), no. 1, Jan.-Feb. 1984 p 2-5 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28856# Joint Publications Research Service, Arlington, Va.
PROCESSING OF 'VENERA-15, -16' RADAR MAPPING IMAGERY
A. Pokrovskiy *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 77-80 Transl. into ENGLISH from Pravda (USSR), 26 Feb. 1984 p 6 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28857# Joint Publications Research Service, Arlington, Va.
ROUGHNESS OF SURFACE OF VENUS FROM BISTATIC RADAR DATA Abstract Only
O. Y. Milekhin, A. I. Kucheryavenkov, A. G. Pavelyv, and O. I. Yakovlev *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 81 Transl. into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 921-928 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28859# Joint Publications Research Service, Arlington, Va.
INTERPRETATION OF GRAVITATIONAL ANOMALIES ON MARS, VENUS AND EARTH Abstract Only
Y. A. Tarakanov, N. S. Kambarov, V. A. Prikhodko, and D. R. Bondarenko *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 82 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Zemli (USSR), no. 12, Dec. 1983 p 3-15 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28860# Joint Publications Research Service, Arlington, Va.
GENERALIZED MODEL OF LUNAR GRAVITATIONAL FIELD Abstract Only
K. G. Tadzhidinov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 83 Transl. into ENGLISH from Astron. Vestn. (USSR), v. 17, no. 4, Oct.-Dec. 1983 p 195-201 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28861# Joint Publications Research Service, Arlington, Va.
OPTICAL STUDIES OF MOON ROCK SAMPLES AT VARIOUS DEGREES OF MATURITY Abstract Only
L. A. Akimov and Y. G. Shkuratov *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 83-84 Transl. into ENGLISH from Astron. Vestn. (USSR), v. 17, no. 4, Oct.-Dec. 1983 p 201-209 (For primary document see N84-28823 19-12)
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N84-28862# Joint Publications Research Service, Arlington, Va.
DISTRIBUTION OF CRATERS OF VARIOUS AGE ON MARTIAN SURFACE Abstract Only
Z. F. Rodionova and K. I. Dekhtyareva *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 84 Transl. into ENGLISH from Astron. Vestn. (USSR), v. 17, no. 4, Oct.-Dec. 1983 p 210-215 (For primary document see N84-28823 19-12)
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N84-29811*# Texas Univ., Austin. Dept. of Aerospace Engineering.
STABILITY AND CAPTURE OF ASTEROIDS
V. Szebehely *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 39-46 refs Sponsored in part by NSF (For primary document see N84-29806 19-88)
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N84-29827# Cornell Univ., Ithaca, N.Y.
THE PUZZLING DYNAMICS OF SATURN'S F-RING
J. A. Burns and M. R. Showalter *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 201-213 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29830# Facultes Universitaires Notre-Dame de la Paix, Namur (Belgium). Dept. of Mathematics.
ORBITAL EVOLUTION OF THE GALILEAN SATELLITES: THE CONSERVATIVE MODEL
Jacques Henrard *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 233-244 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29833# Sao Paulo Univ. (Brazil). Dept. de Astronomia.
A 2:1 COMMENSURABILITY IN URANUS-NEPTUNE SYSTEM
W. Sessin (Inst. Tecnologico de Aeronautica, Sao Jose dos Campos) and M. Tsuchida *In its* The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 263-272 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29834# Bureau des Longitudes, Paris (France).
ANALYTICAL THEORY OF THE MOTION OF THE GALILEAN SATELLITES OF JUPITER: THE FIRST APPROXIMATION
W. Thuillot and D. T. Vu *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 273-294 refs (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29835# Bureau des Longitudes, Paris (France).
OBSERVATIONS OF MUTUAL PHENOMENA OF THE GALILEAN SATELLITES OF JUPITER IN 1979-1980 Abstract Only
J. E. Arlot *In* Sao Paulo Univ. The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 297 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

N84-29837# Sao Paulo Univ. (Brazil). Escola Politecnica.
A SIMPLE THEORY OF TROJAN ASTEROIDS Abstract Only
G. E. O. Giacaglia *In its* The Motion of Planets and Nat. and Artificial Satellites, Volume 2 1983 p 299 (For primary document see N84-29806 19-88)
Avail: NTIS HC A14/MF A01

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N84-29844*# Cambridge Univ. (England). Inst. of Astronomy.
ON THE IDENTIFICATION OF NORMAL MODES OF OSCILLATION FROM OBSERVATIONS OF THE SOLAR PERIPHERY
D. D. Gough and J. Latour (Observatoires du Pic-du-Midi) 1984 16 p refs
(Contract NAGw-91; Grant NsG-7511)
(NASA-CR-173667; NAS 1.26:173667) Avail: NTIS HC A02/MF A01 CSCL 03B

The decomposition of solar oscillations into their constituent normal modes requires a knowledge of both the spatial and temporal variation of the perturbation to the Sun's surface. The task is especially difficult when only limited spatial information is available. Observations of the limb darkening function, for example, are probably sensitive to too large a number of modes to permit most of the modes to be identified in a power spectrum of measurements at only a few points on the limb, unless the results are combined with other data. A procedure was considered by which the contributions from quite small groups of modes to spatially well resolved data obtained at any instant can be extracted from the remaining modes. Combining these results with frequency information then permits the modes to be identified, at least if their frequencies are low enough to ensure that modes of high degree do not contribute substantially to the signal. Author

N84-28849# Joint Publications Research Service, Arlington, Va.
CUTOFF FOR SOLAR COSMIC RAYS IN EARTH'S MAGNETOSPHERE IN MAGNETICALLY QUIET PERIODS Abstract Only
A. S. Biryukov, T. A. Ivanova, L. M. Kovrygina, S. N. Kuznetsov, E. N. Sosovets, L. V. Tverskaya, and K. Kudela *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 70 Transl.

into ENGLISH from Kosmich. Issled. (USSR), v. 21, no. 6, Nov.-Dec. 1983 p 987-906 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

N84-28854# Joint Publications Research Service, Arlington, Va.
LOCALIZATION OF X-RAY BRIGHT SPOTS RELATIVE TO CELLS IN SOLAR CHROMOSPHERIC GRID Abstract Only
S. A. Egamberdiyev *In its* USSR Rept.: Space (JPRS-USP-84-003) 14 Jun. 1984 p 73 Transl. into ENGLISH from Pisma Astron. Zh. (USSR), v. 9, no. 12, Dec. 1983 p 745-749 (For primary document see N84-28823 19-12)
Avail: NTIS HC A07

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N84-29845# Severn Communications Corp., Severna Park, Md.
SURVEY OF ATMOSPHERIC RADIATION COMPONENTS FOR THE GAMMA AND COSMIC RAY ASTROPHYSICS BRANCH OF THE SPACE SCIENCE DIVISION OF THE NAVAL RESEARCH LABORATORY Final Report, 15 Dec. 1982 - 15 Jan. 1984
15 Feb. 1984 10 p
(Contract N00014-83-C-2042)
(AD-A141134) Avail: NTIS HC A02/MF A01 CSCL 03/2

The objects of this study were: (1) Conduct a comprehensive literature search to determine the state-of-the-art knowledge of the effect of atmospheric radiation components on semiconductor materials from sea level to the top atmospheric layers. Emphasis shall be placed on particle propagation, radiation effects on semiconductor materials, and methods of calculating nuclear reaction cross sections. A comprehensive survey shall be made on the interactions between atmospheric components and cosmic rays and the secondary emissions and energy spectra produced. (2) Generate propagation algorithms to describe the penetration of primary cosmic rays into the atmosphere and the production of secondry emissions. (3) Calculate the energy loss rates in semiconductor materials for various cosmic ray components as a function of altitude, geomagnetic location, and zenith and azimuthal angles. GRA

N84-29846# Defence Research Establishment, Ottawa. (Ontario).
RECENT RE-MEASUREMENT OF NEUTRON AND GAMMA-RAY SPECTRA 1080 METERS FROM THE APRD (ARMY PULSE RADIATION DIVISION) CRITICAL FACILITY
H. A. Robitaille and B. E. Hoffarth Jan. 1984 123 p
(AD-A141791; DREO-877) Avail: NTIS HC A06/MF A01 CSCL 20/8

Previously reported measurements of long-range air-transported neutron and gamma-ray spectra from the fast-critical facility at the US Army Aberdeen Proving Ground have been supplemented recently at the 1080-meter position. The results of these determinations are presented herein and compared to several recent calculations from other research establishments. In addition, a summary of all dosimetric measurements obtained in the period 1979-1982 are appended, as are new determinations of APRD soil composition. Integral quantities such as neutron and gamma-ray kermas are very well predicted by the latest calculations, however there still exist significant spectral differences. At short ranges calculated neutron spectra are somewhat softer than experimental measurements, but at the farthest range of 1080 meters agreement is surprisingly good. Gamma-ray spectra remain well-calculated at all ranges. Author (GRA)

99 GENERAL

No abstracts in this category.

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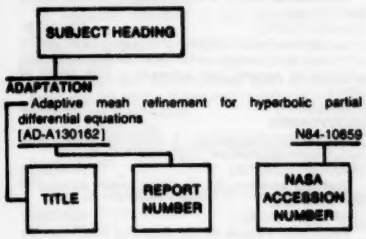
Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

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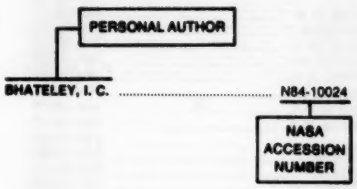

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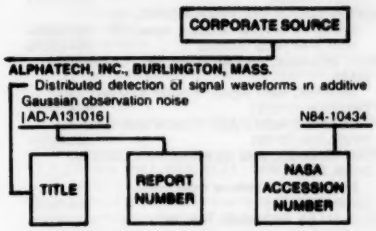

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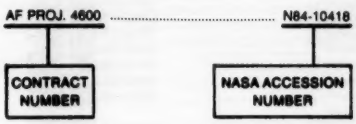

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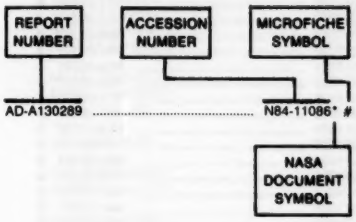

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